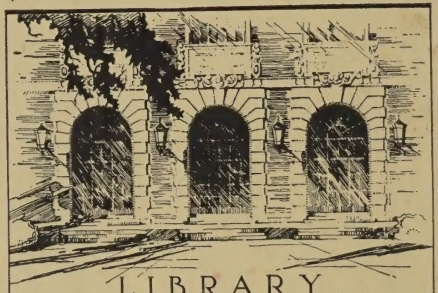

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THE INTERNATIONAL CYCLOPÆDIA

A COMPENDIUM OF HUMAN KNOWLEDGE

REVISED WITH LARGE ADDITIONS

EDITOR-IN-CHIEF

H. T. PECK, Ph.D., L.H.D.
Professor in Columbia University

ASSOCIATE EDITORS

SELIM H. PEABODY, Ph.D., LL.D.
Late President of the University of Illinois

CHARLES F. RICHARDSON, A.M.
Professor in Dartmouth College

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THE

INTERNATIONAL CYCLOPÆDIA.

OPERA-GLASS (Fr. *lorgnette*, Ger. *theater-perspectiv*). This is a double telescope, which is used for looking at objects that require to be clearly seen rather than greatly magnified, such as adjoining scenery and buildings, the performers of a theater, or opera, etc. It is from its use at an opera that it derives its name. The opera-glass is short and light, and can be easily managed with one hand. Its small magnifying power (from 2 to 3 at the most), and the large amount of light admitted by the ample object-glass, enable it to present a bright and pleasing picture, so that the eye is not strained to make out details, as in telescopes of greater power, which generally show a highly magnified but faint picture. It allows the use of both eyes, which gives to the spectator the double advantage, not possessed by single telescopes, of not requiring to keep one eye shut, a somewhat unnatural way of looking, and of seeing things stand out stereoscopically as in ordinary vision. The opera-glass is in consequence the most popular of telescopes, and requires almost no art in its use.

The opera-glass is the same in principle as the telescope invented by Galileo. It consists of two lenses, an object-lens and an eye-lens. The object-lens is convex, and the eye-lens concave. They are placed nearly at the distance of the difference of their focal lengths from one another. Fig. 1 represents the action of the telescope; *o* is the object-lens, and *e* the eye-lens, and *ae* is the axis of the instrument. The object-lens would form an image, *cab*, of the object looked at, at or near its focus, but eye-lens intervening, converts the light converging to *cab* to light diverging apparently from an object in front, CAB. To show more clearly the changes which the light undergoes, the course of a pencil of rays proceeding from the top of an object is traced. The ray proceeding from the top of the object to the center of the lens, *o*, makes an angle, *ro*A, with the axis. This is the same as the angle *aob;* and either of these angles gives half the angle under which the object is seen to the unaided eye. The three extreme rays, *r*, *r*, *r*, of the pencil appear in the figure nearly parallel, although they come from a point. The object is at a considerable distance from the object-glass or eye, so that it is not possible in so limited a figure to show their divergence. After passing through the object-lens, the three rays proceed to the point *b*, in the image which the object-lens would form at *cab*, if no eye-lens were there. This image, as shown in the figure, is inverted, and would be seen as such if the eye were placed about ten inches (the distance of distinct vision) behind it. The three rays in question do not reach the point *b* in consequence of the eye-lens intervening, and their course onwards to that point, after passing the eye-lens, is shown by dotted lines. The actual course, after passing the second lens, is shown again by the full lines, *r*, *r*, *r*, which to the eye placed immediately behind the eye-lens, appear to proceed from the point B in front. As the light comes from B in the same direction as it comes from the actual point in the object, the image is erect. What holds for the point B, holds for every point in the image and object. To find the magnifying power, it is necessary to join B*e* and C*e*, and produce the lines thus formed to *b* and *c*. As the eye is placed immediately behind the eye-lens, the angle under which the magnified object is seen is the angle B*e*C, which is equal to *ceb*. Now, the angle under which the object itself is seen at *o* or at *e*—for the slight difference has no effect at the distance at which objects require to be seen by a telescope—is twice the angle *ro*A, or which is the same thing, the angle *cob*. The ratio of the angle *ceb* to the angle *cob*, which is the magnifying power, is easily seen to be the same as that of the line *oa* to the line *ae*. But *oa* is the focal length of the object-glass, and *ae* is the focal length of the eye-glass, so that the magnifying

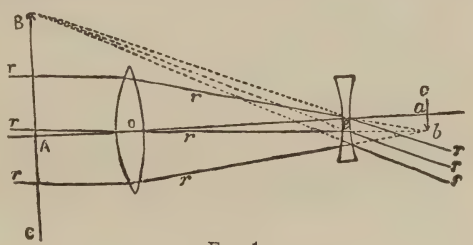

FIG. 1.

power of the instrument is the number of times the focal length of the eye-glass is contained in that of the object-glass. The longer, therefore, the focal length of the object-lens, or the shorter the focal length of the eye-lens, the greater the magnifying power. This may be practically expressed thus: the flatter the object-lens, and the hollower the eye-lens, the more are objects magnified by the glass. The magnifying power may be found with sufficient accuracy by looking at an object with one eye through the tube and the other eye unaided, and so handling the glass that the magnified image seen by the one eye is superposed on the object seen by the naked eye, when a comparison of their relative sizes can be easily made. For great magnification, the instrument requires to be greatly lengthened—a condition inconsistent with its use as an opera-glass. In addition, a high magnifying power is attended with the disadvantage that the field of view, or amount of object or objects seen, becomes too limited. On screwing out the instrument, it will be seen that objects increase in size as the instrument is lengthened, but that the picture becomes more and more limited, showing that a large power and a large field are incompatible. The opera-glass need not be set to the same precise point as is necessary with ordinary terrestrial telescopes, as the lengthening or shortening of the instrument does not produce so decided an effect on the divergence of the light; the change of divergence, caused by screwing the opera-glass out or in, is so slight as not much to overstep the power of adjustment of the eye, so that an object does not lose all its distinctness at any point within the range of the instrument. There is, however, a particular point at which an object at a certain distance is best seen.

The two telescopes are identical in construction, and are placed parallel to each other. The blending of the two images is easily effected by the eyes, as in ordinary vision. Opera-glasses have now come into such demand, that they form an important article of manufacture, of which Paris is the great seat. So largely and cheaply are they produced in Paris that it has nearly a monopoly of the trade. They may be had from $2.50 to $30 or $35. The cheapest opera-glasses consist of single lenses, those of the better class have compound achromatic lens. A very ordinary construction for a medium price is to have an achromatic object-lens, consisting of two lenses and a single eye-lens. In the finest class of opera-glasses, which are called *field-glasses*, both eye-lenses and object-lenses are achromatic. Plössl's celebrated field-glasses (Ger. *feldstecher*) have twelve lenses, each object-lens and eye-lens being composed of three separate lenses.

OPER'CULUM (Lat. a lid), a term used in botany chiefly to designate the lid or covering of the mouth of the urn or capsule (*theca*) which contains the spores of mosses. Before the ripening of the spores, the operculum is generally concealed by the *calyptra;* but after the calyptra has been thrown off, the operculum itself also generally falls off, leaving the peristome visible, and the mouth of the urn open. In some cases the operculum does not fall off, and the urn opens by valves.

In zoology, the term operculum is chiefly employed to denote the covering which many gasteropod mollusks form for the mouth of their shell. It is attached to the back of the foot of the mollusk. In some it is calcareous, forming a shelly plate; in some it is horny; whilst gasteropods very nearly allied to those which possess it, are destitute of it altogether. The operculum increases in various ways, so as to present in different genera great diversity of structure, concentric, spiral, unguiculate, etc.

OPHICEPH'ALUS, a genus of fishes, of the family *anabasidæ* (q.v.), sometimes regarded as constituting a distinct family *ophicephalidæ,* because there is a mere cavity for retaining water to supply the gills, and no pharyngeal laminæ, and because of the long eel-like form and the flattened head, which is covered with large scales. Some of them are common in the fresh waters of the East Indies, are often found among wet grass, often travel from one pool to another, and are capable of subsisting for a long time in half-dried mud, descending into it when the pools dry up. The Cora-mota or Gachua of India (*O. gachua*) is much used for food by the natives, although generally rejected by Europeans on account of its very snake-like appearance. It is very tenacious of life, and is not only brought to the Indian markets alive, but is cut to pieces whilst still living for the convenience of buyers.

OPHICLEIDE (Gr. *ophis,* serpent, and *kleis,* key), a musical wind-instrument of brass or copper, invented to supersede the serpent (q.v.) in the orchestra and military bands. It consists of a conical tube, terminating in a bell like that of the horn, with a mouth-piece similar to that of the serpent, and ten ventages or holes, all stopped by keys like those of the basson, but of larger size. Ophicleides are of two kinds, the bass and the alto. The bass ophicleide offers great resources for maintaining the low part of masses of harmony. Music for it is written in the bass clef, and the compass of the instrument is from B, the third space below the bass staff to C, the fifth added space above it, including all the intervening chromatic intervals. The alto ophicleide is an instrument of very inferior quality, and less used. Its compass is also three octaves and one note. The music for it is written in the treble cleff, and an octave higher than it is played. Double bass or monster ophicleides have sometimes been used in large orchestras, but the amount of breath which is required to play them has prevented their coming into general use.

OPHIDIA. See Serpents.

OPHIOGLOSSEÆ, a suborder of *filices* or ferns (q.v.), consisting of a few rather elegant little plants with an erect or pendulous stem, which has a cavity instead of pith, leaves with netted veins, and the spore-cases (*thecæ*) collected into a spike formed at the edges of an altered leaf, two-valved, and without any trace of an elastic ring. They are found in warm and temperate countries, but abound most of all in the islands of tropical Asia. Several species are American. See illus., LYCOPODIACEÆ, vol. IX.

O'PHIR, a region frequently mentioned in the Old Testament, and from which the ships of Solomon, fitted out in the harbors of Edom, brought gold, precious stones, sandal-wood, etc. The voyage occupied three years. Where Ophir was situated has been a much, in fact, a superfluously disputed question. It was probably either on the e. coast of Africa about Sofala, or in Arabia, or in India, but in which of the three countries is doubtful. Huet, Bruce (the traveler), the historian Robertson, M. Quatremère, etc., are in favor of Africa; Michaelis, Niebühr (the traveler), Gosellin, Vincent, Winer, Fürst, Knobel, Forster, Crawfurd, and Kalisch, of Arabia; Vitringa, Reland, Lassen, Ritter, Bertheau, and Ewald, of India. Josephus, however, it should be said, placed Ophir in the peninsula of Malacca, and his very respectable opinion has been adopted by sir J. Emerson Tennent in his work on Ceylon. For a complete discussion of the point, see Karl Ritter's *Erdkunde* (vol. xiv. 1848), 80 octavo pages of which are devoted to Ophir.

OPHIR, called by the Malays, Gunong Pasaman, a volcanic mountain in the highlands of Padang, island of Sumatra, lies in 0° 4′ 58″ n. lat., and 99° 55′ e. long.; the peak called Korinchi or Indrapura attains the height of 12,100 ft. above the sea. The western peak is called Pasaman. The numerous inhabitants have cleared off forest and brought under cultivation large tracts of land on the slopes of Ophir, and its base is studded with villages. The Ophir districts are most beautiful, and the lofty waterfalls, contrasting with the bright-green foliage of the mountain, highly picturesque.

OPHISU'RUS. See SNAKE-EEL.

O'PHITES (Gr. *ophitai*, "serpent-brethren," from *ophis*, a serpent), a sect of gnostics (q.v.), who while they shared the general belief of dualism, the conflict of matter and spirit, the emanations, the demiurgos, and other notions common to the many subdivisions of this extraordinary school, were distinguished from all by their peculiar doctrine and worship connected with their *ophis* or serpent. The ophites, like most other gnostics, regarded the demiurgos, or the Jehovah of the Old Testament, with great abhorrence, but they pursued this notion into a very curious development. Regarding the emancipation of man from the power and control of the demiurgos as a most important end, they considered the serpent who tempted Eve, and introduced into the world "knowledge" and revolt against Jehovah, to have been the great benefactor of the human race. Hence their worship of the serpent. Some of the details of their system were very strange. We may instance their singular attempt to engraft "ophism" on Christianity; their seeking, as it were, to impart to the Christian eucharist an ophite character, by causing the bread designed for the eucharistic sacrifice *to be licked by a serpent*, which was kept in a cave for the purpose, and which the communicants kissed after receiving the eucharist (*Epiph. Hor.* 37, s. 5). Our information, however, regarding them is very meager, and comes chiefly from antagonistic sources. The ophites originated in Egypt, probably from some relation to the Egyptian serpent-worship, and spread thence into Syria and Asia Minor. Offshoots of this sect are the Cainites. See CAIN and SETHITES: SERPENT WORSHIP.

OPHIU'RANS. See STAR-FISH.

OPHRYDEÆ, a tribe of orchidaceous plants, having the granular pollen united in two pollinia by an elastic tissue or axis, and attached to a gland or viscid disk; anther terminal, usually erect, persistent, with two separate, perfect cells; terrestrial plants, with tuberous or fleshy fibrous roots; inhabitants of all temperate and sub-tropical regions (Central and Southern Europe and South Africa), but scarce in the tropics. There are some 17 cultivated genera, of which Orchids and Habenaria are represented in the U. S.

OPHTHAL'MIA (derived from the Greek word *ophthalmos*, the eye) was originally and still is sometimes used to denote inflammation of the eye *generally*, but it is at the present time usually restricted to designate inflammatory affections of the mucous coat of the eye, termed the *conjunctiva*.

There are several important and distinct varieties of ophthalmia (in the restricted sense of the word) which require special notice.

Catarrhal Ophthalmia.—Its leading symptoms are redness of the surface of the eye (the redness being superficial, of a bright scarlet color, and usually diffused in patches), sensations of uneasiness, stiffness and dryness, with slight pain, especially when the eye is exposed to the light; an increased discharge, not of tears, except at the beginning of the attack, but of mucus, which at first is thin, but soon becomes opaque, yellow, and thicker; pus (or matter, as it is popularly termed) being seen at the corner of the eye, or between the eyelashes along the edges of the lids, which it glues together during the night. The disease results in most cases from exposure to cold and damp, and is very apt to be excited by exposure to a draught of air, especially during sleep. It is popu-

larly known as a *cold* or a *blight* in the eye. With regard to treatment, the patient should remain in rooms of a uniform temperature, and should at once take about five grains of calomel, followed by a black draught. The eye should be frequently bathed with poppy decoction, lukewarm or cold as the patient prefers. If the affection does not readily yield to these measures, a drop of a solution of nitrate of silver (four grains of the nitrate to an ounce of distilled water) should be let fall into the eye twice or thrice a day. It usually causes a smarting sensation for about ten minutes, after which the eye feels much easier than it did before the drop was applied. The adhesion of the eyelids in the morning may be avoided by smearing their edges at bedtime with a little spermaceti ointment.

Purulent ophthalmia differs from catarrhal ophthalmia in the severity of its symptoms, and in its exciting causes. It is a violent form of inflammation of the conjunctiva; is accompanied with a thick purulent discharge on the first or second day of its commencement, and is very apt to occasion loss if vision. There are three remarkable varieties of this affection, called respectively (1) purulent ophthalmia of adults, or Egyptian ophthalmia, or contagious ophthalmia; (2) gonorrheal ophthalmia; and (3) purulent ophthalmia of newly-born children. (1) *Purulent ophthalmia of adults* begins with the same symptoms as catarrhal ophthalmia, but in a very exaggerated form. The conjunctiva rapidly becomes intensely red, and soon appears raised from the sclerotic by the effusion of serum between them, projecting around the cornea, which remains buried, as it were, in a pit. Similar effusion takes place beneath the mucous membrane lining the eyelids, causing them to project forwards in large livid convex masses, which often entirely conceal the globe of the eye. These symptoms are accompanied by severe burning pain, great headache, fever, and prostration. When the disease is unchecked, it is liable to produce ulceration or sloughing of the cornea, with the escape of the aqueous humor and protrusion of the iris; and even when these results do not follow, vision is often destroyed by permanent opacity of the cornea. It is a common disease in India, Persia, and Egypt; and in consequence of its having been imported from the last named country into England by our troops in the beginning of the present century, it got the name of Egyptian ophthalmia. Some idea of its prevalence and of its danger may be formed from the facts (1) that two-thirds of the French army in Egypt were laboring under it at the same time, and (2) that in the military hospitals at Chelsea and Kilmainham there were, in Dec., 1810, no fewer than 2,317 soldiers who had lost the sight of both eyes from this disease. Until after the war in Egypt, the disease was unknown in Europe. Since that time it has not unfrequently broken out in this country—not only among troops, but in schools, asylums, etc. The disease is unquestionably contagious, but there are good reasons for believing that it often arises, independently of contagion, from severe catarrhal ophthalmia under unfavorable atmospheric and other conditions; and that having so originated, it possesses contagious properties. *Gonorrheal ophthalmia* arises from the application of gonorrheal discharge or matter to the surface of the eye; and hence is most common in persons suffering from the disease from which this variety obtains its specific name. It is, moreover, not unfrequently occasioned by the common but disgusting practice adopted by the poorer classes, of bathing the eyes in human urine, under the idea that by this procedure they strengthen the sight. In its symptoms, it is almost identical with ordinary purulent ophthalmia. The *purulent ophthalmia of children* usually begins to appear about the third day after birth. It is a very common affection, and its importance is apt to be overlooked until it has made considerable progress. If the edges of the lids appear red and glued together, and if the eye, when the lids are separated, shows redness and swelling of the conjunctiva, there is no doubt of the nature of the disease, which, if not checked, progresses in much the same way as in adults. It is, however, much more amenable to treatment, and with proper care the sense of sight is seldom impaired, provided the disease has not extended to the cornea before medical aid is sought. Of the treatment of purulent ophthalmia in these various forms, we shall say nothing more than that it must be left exclusively to the medical practitioner, whose advice should be sought as soon as there is the slightest suspicion of the nature of the case.

There is one more form of this disease which is of very common occurence, and has received the various names of *strumous* (or *scrofulous*), *pustular*, and *phlyctenular ophthalmia*. It is intimately connected with the scrofulous constitution, and is most prevalent in children from 4 to 10 or twelve years of age. The most prominent symptom is extreme intolerance of light, the lids being kept spasmodically closed. When they are forcibly separated, a slight vascularity, usually stopping at the edge of the cornea, is observed, and at or about the line of separation between the cornea and sclerotic small opaque pimples or pustules appear. The treatment consists (1) in improving the general health by due attention to the secretions, and the subsequent administration of tonics (such as quinia and cod-liver oil), and change of air; and (2) in local applications, such as solution of nitrate of silver, or wine of opium, dropped into the eye, or stimulating ointments (such as dilute citrine ointment) smeared over the edges of the lids at bedtime. This form of disease, being dependent on constitutional causes, is often very obstinate, and is always liable to recur. It is not unfrequently attended with the annoying complication of a skin disease, known as *crusta lactea*, on the cheeks, in consequence of the irritation caused by the flow of scalding tears. The crusts or scabs are easily removed

by a poultice or warm water dressing after which the part must be bathed by a lotion, consisting of a dram of oxide of zinc in four ounces of either pump or rose water.

OPHTHALMIC GANGLION, one of the four cephalic ganglia of the great sympathetic nerve. It is about the size of a pin's head, and situated at the back part of the orbit, between the optic nerve and the external rectus muscle. It lies in a quantity of loose fat which makes its dissection somewhat difficult. It has three branches of communication which enter its posterior border. The long branch is derived from the nasal branch of the ophthalmic nerve (first division of the 5th nerve). The second branch, or root, is derived from a branch of the third nerve supplying the inferior oblique muscle of the eyeball. The third branch, or root, is a slender filament from the cavernous plexus of the sympathetic. According to Tiedemann this ganglion receives a filament of communication from Meckel's ganglion (q.v.). Its branches of distribution are the short ciliary nerves. These are 10 or 12 delicate filaments arising from the fore-part of the ganglion in two bundles. They run forward with the ciliary arteries, pierce the sclerotic coat at the back part of the globe, pass forward in delicate grooves on its inner surface, and are distributed to the ciliary muscle and the iris. It is therefore seen that the ophthalmic ganglion is one of the most important nerve centers in the whole body, although no larger than a pin's head. The ciliary muscle is the muscle of accommodation of the eye, causing variation in the form of the aqueous humor and the crystalline lens so as to accommodate the focal length of the eye to the distance of objects. Its supply of nerve force to the muscular fibers of the iris is also intimately connected with the focal length of the eye-apparatus, and its connections with this part of the eye are of marvelously beautiful character.

OPHTHALMOL'OGY. See EYE ; EYE, DISEASES OF THE.

OPHTHALMOSCOPE, THE, is an instrument recently invented for the purpose of examining the deep-seated structures of the eye, and for detecting disease in them. In its simplest form, it is merely a concave circular mirror, of about 10 in. focus, made of silvered glass or polished steel, and having a hole in the center; and with it there is supplied, as a separate piece of apparatus, a convex lens an inch and a half in diameter, with a focal length of about two and a half inches, set in a common eye-glass frame, with a handle 3 in. long. The patient (his pupil having been previously dilated by the application of a drop of solution of atropine) is made to sit by a table in a dark room, with a sliding argand lamp placed by the side of his head, with the flame on a level with the eye, from which it is screened by a little flat plate of metal attached to the burner. The following description of the mode of using the instrument, and of the parts brought into view by it, is borrowed from the article on this subject contributed by Mr. Haynes Walton to the last edition of Druit's *Surgeon's Vade Mecum:* "The operator sits directly in front, and holding the instrument close to his eye, and a little obliquely to catch the light from the lamp, he commences, at the distance of about 18 in. from the patient, to direct the reflection on the eye. When this is got, the convex lens must be held at a distance of two and a half inches from the eye, and the focusing commenced by moving it slowly backwards and forwards. When the light fairly enters the eye a reddish glare appears; and as it is focused, an orange-red or orange-yellow is seen; then the blood-vessels of the retina come into view. The retina itself presents a whitish aspect, through which the choroid is more or less discernible. The entrance of the optic nerve should now be sought. The way to discern it is to make the patient look inward. It appears as a white circular spot, in the center of which are the central vein and artery of the retina, giving off six or eight branches." This optic disc is the most important part to be observed; but a thorough ophthalmoscopic examination will reveal structural differences, not only in it, but in the retina, choroid, and vitreous humor, and will reveal cataract in its early stage. In short, the ophthalmoscope is now as essential in the diagnosis of diseases of the deep-seated parts of the eye as the stethoscope is in the diagnosis of thoracic diseases.

OPIE, AMELIA (ALDERSON), 1769–1853, b. England; second wife of John Opie, the painter, whom she married in 1798. She had already written much, but had published but one novel. After her husband's death, she lived at her father's house in Norwich. She wrote but little after becoming a member of the society of Friends in 1825. Among her works are *Father and Daughter*, 1801; *Poems*, 1802; *Adeline Mowbray*, 1804; *The Warrior's Return and Other Poems*, 1808; *Detraction Displayed*, 1828; and *Lays for the Dead*, 1833.

OPIE, JOHN, A. R., was b. at the village of St. Agnes, 7 m. from Truro, Cornwall, in May, 1761. His father, a master carpenter, wished him to follow the same trade, but his bias for art was strong; and his attempts at portrait-painting having attracted the notice of Dr. Wolcot, afterward celebrated as Peter Pindar, he had the advantage of his advice in the practice of the art, and his exertions in procuring him employment. And at length, in 1780, he was taken to London by Dr. Wolcot; and immediately came to be acknowledged by the fashionable world as the "Cornish Wonder." This tide of good fortune soon ebbed, but not before Opie had realized a moderate competency. The loss of popular favor, however, only served to bring out more strongly those points in Opie's character on which his reputation mainly rests, viz., manly independence and strong

love of art. He stooped to no device to retain fashionable patronage, but calmly and unremittingly entered on that department of painting which, according to the notions of his time, was the only style of high art, viz., historical or scriptural subjects, executed on a large scale. His pencil was employed by Boydell in his well-meant and magnificent scheme to elevate British art; he also painted a number of works in the illustration of Bowyer's "English History," Macklin's "Poets," and "Biblical Gallery," and other similar undertakings. His pictures of the "Murder of James I. of Scotland," the "Slaughter of Rizzio," "Jephthah's Vow," "Presentation in the Temple," "Arthur and Hubert," "Belisarius and Juliet in the Garden," are his most noted works. Opie was elected an associate of the royal academy in 1786, and academician in the following year. He devoted part of his time to various literary efforts tending to the illustration of art: these were chiefly the "Life of Reynolds" in Dr. Wolcot's edition of Pilkington's *Dictionary of Painters;* a letter in the *North Briton*, recommending the formation of a national gallery, reprinted as *An Inquiry into the Requisite Cultivation of the Fine Arts in Britain;* lectures on art, delivered at the royal institution, which, though listened to with great attention by a select and fashionable audience, do not seem to have been satisfactory to himself, as he declined to continue them. When Fuseli, on being appointed keeper, resigned the professorship of painting, Opie was appointed to that office; and the four lectures which he delivered—he died before completing the course—bear the stamp of practical experience and shrewd observation. Opie was twice married. He obtained a divorce from his first wife; but his second, well known as one of the most popular novelists of the day, appreciated his high character, which she set forth, after his death, in a memoir published along with his lectures. He died somewhat suddenly in his house, St. Bernard street, Oxford street, April 9, 1807, and was buried in the crypt of St. Paul's, near the grave of Reynolds.

OPIN'ICUS, one of the fabulous creatures known in heraldry, with the head and neck of an eagle, the body of a lion, wings, and a short tail like that of a camel. Such a monster, with wings endorsed or, was the crest of the company of barber-surgeons of London.

OPINION OF COUNSEL, is the technical name for the advice given by a barrister or advocate. The attorney or solicitor writes a statement of facts, called "a case" in America, and "a memorial" in Scotland, which ends by asking certain queries, and the answer written by the counsel is his opinion. A counsel is not liable for any damages caused by his giving a wrong opinion though the result of gross ignorance, this being one of the privileges of counsel.

OPITZ, MARTIN, a famous German poet, was b. Dec. 23, 1597, at Bunzlau, in Silesia. He received an education of the highest kind; and after some time spent at the court of the duke of Liegnitz, he accepted, in 1622, an invitation by Bethlen Gabor, prince of Transylvania, to teach philosophy and the *Humaniora* at Weissenburg; but disliking the rudeness of the country, he soon returned to the court of the duke of Liegnitz. In 1624, his first poems were published, and in the same year his work *Von der deutschen Poeterei*, in which he laid the foundation of a system of German poetics. In 1625 he went to Vienna, where, on account of an elegy on the death of an archduke, he received a laurel crown from the hands of the emperor, Ferdinand II. In 1626 he became secretary, although a Protestant, to the burggraf Karl Hannibal of Dohna, a distinguished Roman Catholic and imperialist, and was employed in various transactions with foreign courts. In 1629 the emperor raised him to the rank of nobility. After the death of the burggraf of Dohna, in 1633, he returned to the courts of Liegnitz and Brieg. About this time he published *Vesuv*, a didactic poem, and his *Trostgedicht in Widerwärtigkeit des Kriegs*, the best of his poems, which were followed by an opera called *Judith*, a translation of the *Antigone* of Sophocles, and a translation of the Psalms. In 1638 he was appointed secretary and historiographer to Ladislaus IV. of Poland. But in the midst of his days, and when he had attained to fame and prosperity, he was cut off by the plague at Danzig, Aug. 20, 1639. Opitz was more honored by his contemporaries than almost any other poet ever was. German poetry, which had been neglected and despised, began again to be esteemed and cultivated. The popularity of Opitz and his relations with the chiefs of the Roman Catholic party, led to the adoption, throughout the whole of Germany, of the form given to the German language by Luther, which had previously obtained general acceptance only in the Protestant states. His poetry is characterized by careful attention to language and meter, and by reflection rather than by brilliant fancy or deep feeling. There are several editions of his works, but none is quite complete (3 vols., Breslau, 1690; 3 vols., Amst. 1646; and 3 vols. Frankfort and Leipsic, 1724.)

O'PIUM, one of the most valuable of medicines, is the dried juice of the unripe capsules of a species of poppy (q.v.), *papaver somniferum*, sometimes called the common poppy, and sometimes the white poppy, although the latter name is really appropriate only to one of its varieties. The plant is probably a native of some of the warmer parts of Asia, although it is now common in cultivated and waste grounds throughout all the s. and middle of Europe, and is occasionally found in Britain. It is an annual, varying in height from 1 to 6 ft., erect, branched, of a glaucous green color, with ovate-oblong sessile leaves, the stem and leaves generally smooth, the branches terminated by large

flowers on long stalks, the capsules globose or roundish-ovate and smooth. There are two principal varieties cultivated for the opium which they yield, which have been regarded by some botanists as distinct species; the one (*papaver somniferum*) having generally red or violet-colored flowers, numerous flower-stalks rising together, globose capsules opening by a circle of pores under the persistent stigma, and black seeds; the other (*P. officinale*) having white flowers, solitary flower-stalks, the capsules somewhat ovate, the circle of pores almost wanting, the seeds white. The former variety is generally cultivated in the mountainous parts of the n. of India, the latter in the plain of Bengal, where the poppy-fields are described by Dr. Hooker as resembling green lakes studded with white water-lilies. The cultivation of the poppy for the sake of opium is carried on in many parts of India, although the chief opium district is a large tract on the Ganges, about 600 m. in length and 200 m. in breadth, which was divided by the east India company into two *agencies*, that of Behar and that of Benares, the central factory of the former being at Patna, and that of the latter at Ghazeepore. The poppy is also extensively cultivated for opium in the Asiatic provinces of Turkey, in Egypt, and in Persia. Opium of very good quality is also produced, although not to any considerable amount, in some parts of Europe, and even in Britain. It is sometimes alleged that a much warmer climate than that of Britain is requisite for the profitable production of opium, but the chief fault of the climate seems rather to be the frequency of wet weather. Very fine specimens of opium have been produced, and the produce per acre has been found amply remunerative; but a great difficulty is experienced in obtaining labor at a moderate rate for a few days only at a time, and when the experiment is conducted on a small scale, only for a few hours daily. This difficulty was much felt in an experiment, otherwise most successful, which was made at Edinburgh, by Mr. Young, a surgeon, who, about the year 1830, obtained 56 lbs. of opium from one acre of poppies, and sold it at 36s. a lb. It was of excellent quality. His mode of cultivation was similar to that usual in India, The seed being sown in spring on a rich soil, the plants were kept clear of weeds, and when they had flowered and produced capsules, incisions were made in the capsules, and the exuded juice collected as described below. The capsules vary from the size of a hen's egg to that of the fist. In India, the poppy flowers in the end of January and beginning of February.

The poppy requires for its profitable cultivation a rich soil, and in India is generally sown in the neighborhood of villages where manure can be easily obtained. The soil ought to be fine and loose when the seed is sown. The subsequent cultivation consists chiefly in thinning and weeding. Irrigation is practiced. Mild moist weather, with night-dews, is deemed most favorable during the time of the collection of the opium. Very dry weather diminishes the flow of the juice, and much rain is injurious.

The opium poppy is cultivated for other purposes besides the production of opium, concerning which see Poppy.

Opium, as a commercial article, is of great importance, exceeding indeed that of any other drug in use, and the cultivation of the opium poppy (*papaver somniferum*) in British India forms a most extensive branch of agriculture, and the collection and preparation of the drug itself employs a large number of persons in the Patna, Malwa, and Benares districts of Bengal. Indeed, during the whole existence of the East India Company, the production of this drug was of the first importance; its employment as a habitual narcotic, as well as a medicine amongst all the eastern nations, demands an enormous supply. The seed is sown in India in the beginning of November; it flowers in the end of January, or a little later; and in three or four weeks after, the capsules or poppy-heads are about the size of hens' eggs, and are ready for operating upon. When this is the case, the collectors each take a little iron instrument, called a *nushtur;* it is made of three or four small plates of iron, narrow at one end and wider at the other, which is also notched like a saw; with these instruments they wound each full-grown poppy-head as they make their way through the plants in the field. This is always done early in the morning, before the heat of the sun is felt; during the day the milky juice of the plant oozes out, and early on the following morning it is collected by scraping it off with a kind of scoop, called a *sittooha*, and transferred to an earthen vessel called a *kurrace*, hanging at the side of the collector. When this is full, it is carried home and transferred to a shallow open brass dish, called a *thallee*, and left for a time tilted on its side, so that any watery fluid may drain out; this watery fluid is called *pusseewah*, and is very detrimental to the opium unless removed. It now requires daily attendance, and has to be turned frequently, so that the air may dry it equally, until it acquires a tolerable consistency, which requires three or four weeks; it is then packed in small earthen jars, and taken to the *godowns*, or factories; here the contents of each jar are turned out and carefully weighed, tested, valued, and credited to the cultivator. The opium is then thrown into vast vats, which hold the accumulations of whole districts, and the mass being kneaded, is again taken out and made into balls or cakes for the market.

This is a very important operation, and is conducted in long rooms, the workmen sitting in rows, closely watched by the overseers to insure the work being carefully performed. Before each workman is a tray, and within easy reach is placed the *tagar*, a tin vessel for holding as much opium as will make three or five balls. On the tray is another basin containing water, and a smaller tray; on this tray stands a brass cup, into which

the ball or cake is molded, also a supply of thin layers of poppy petals, formed by laying them out overlapping each other, and pressing them upon one another; these are prepared by women in the poppy-fields, and with these is a cup filled with a sticky fluid called *lewah*, made from opium of inferior quality. The operator begins his work by taking the brass cup and placing on its bottom one of the cakes of poppy petals, which he smears over with the *lewah;* then adds other cakes of petals to overlap and adhere to the first, until the cup is lined and a coat of petals is thus formed for the opium, of which he takes the exact quantity as near as he can guess, works it into a ball, and places it in the basin, so that the lining of petals encloses it and sticks to it, in consequence of the *lewah* smeared on the inner side of the thin cakes of petals. Other petals are put on the upper part of the ball, and the whole gathered round it, forming a case about as thick as a bank-note. Each man's work for the day is kept by itself, and after having been duly registered, is taken to a vast drying-room, where the balls are placed in tiers on lattice-work racks, and are continually turned and examined by boys, to keep them from insects and other injuries. After being fully dried, these balls are packed in chests for the market.

The manufacture of opium is carried on to the greatest extent in India, but large quantities are also made in Turkey, and this latter is considered the best in quality. It is also made at Trebizond in Persia, and in Egypt; occasionally it has been produced in Germany, France, and England. Of the Indian opium there are several qualities, as Bengal, Patna or Benares opium, Garden Patna, Malwa, fine Malwa, Cutch, and Kandeish opium.

The opium revenue for India in 1889–90 was given at £8,546,400, on which the net profit was about £90 per chest. The area under cultivation in Bengal and Bombay is about 560,608 acres. In 1880–81, 92,190 chests of opium, valued at £13,600,148, were exported. Next to China, the largest consumption of Indian opium is by the Burmese and the natives of the Malacca straits, who take annually to the value of nearly a million sterling.

In Europe, with very slight exceptions, opium is used for medicinal purposes only, and large quantities of it undergo a still further stage of manufacture, in order to separate from it the active principles morphine, narcotine, etc. In Great Britain, the chief manufacture of these salts of opium is carried on in Edinburgh, where two firms, Messrs. T. and H. Smith, and J. F. Macfarlane & Co., have attained great reputation, and manufacture these products upon an immense scale, supplying probably a fifth of the whole quantity manufactured.

Chemical and Medicinal Properties.—The only variety recognized in the British pharmacopœia is the Turkey opium. The chemical composition of opium has been studied by various chemists, amongst whom must be especially mentioned prof. Mulder of Utrecht, and Prof. Anderson of Glasgow. The following constituents occur in most kinds of opium:

	Meconic acid	$C_7H_4O_7 \cdot 3H_2O$,	from 4 to 8 per cent.
Organic Bases or Alkaloids.	Morphine	$C_{17}H_{19}NO_3 \cdot H_2O$,	from 4 to 12 "
	Codeine	$C_{18}H_{21}NO_3 \cdot H_2O$,	less than 1 "
	Thebaine	$C_{19}H_{21}NO_3$,	"
	Papaverine	$C_{21}H_{21}NO_4$.	"
	Narcotine	$C_{22}H_{23}NO_7$,	from 6 to 10 "
	Narceine	$C_{23}H_{29}NO_9 \cdot 2H_2O$,	from 6 to 13 "
	Meconine	$C_{10}H_{10}O_4$,	less than 1 "
	Resinous matter		from 2 to 4 "
	Caoutchouc		from 4 to 6 "
	Mucilage, gum, and extractive matters		from 40 to 50 "

In addition to the six alkaloids named in this table, a seventh, named opianine, has been found in Egyptian opium, but in no other varieties.

Some of the most important and characteristic of these constituents, as meconic acid, morphia, and narcotine, are noticed in special articles. The only isolated constituents of opium which are now used in medicine are *codeia* (so called from the Greek word *kōdeia*, a poppy-head), which has been asserted by Magendie and others to act in the same manner as, although less powerfully than, morphia, but which is now seldom prescribed, as it is not a pharmacopœial preparation; and *morphia*, which has already been described.

The only test given in the accepted pharmacopœia for the purity of opium is the determination of its percentage of morphia, which is a process requiring a considerable amount of chemical skill.

Following the arrangement adopted by Pereira (*Elements of Materia Medica*, 4th ed.), we have just quoted, we shall consider (1) the effects of one or a few doses of opium employed medicinally or as a poison; (2) the effects of the habitual employment of opium, either by chewing or smoking it; and (3) its good and bad effects on the different systems of organs.

1. In *small doses*, as from a quarter of a grain to a grain, it acts as an agreeable stimulant, this effect being followed by a desire to sleep, accompanied by dryness of the

mouth and throat, thirst, and slight constipation. When it is given in a *full medicinal dose* (as from two to four grains), the stage of excitement is soon followed by well-marked depression or torpor, both of the bodily and mental organs, and an almost irresistible sleepiness; these effects being usually succeeded by constipation, nausea, furred tongue, headache, and listlessness. When it is administered in a dangerous or poisonous dose, the symptoms, as summed up by Dr. Christison in his work *On Poisons*, begin with giddiness and stupor, generally without any previous stimulus. The stupor rapidly increasing, the person becomes motionless, and insensible to external impressions; he breathes very slowly, generally lies quite still, with his eyes shut and the pupils contracted; and the whole expression of the countenance is that of deep and perfect repose. As the poisoning advances, the features become ghastly, the pulse feeble and imperceptible, the muscles exceedingly relaxed, and, unless assistance is speedily procured death ensues. If the person recovers, the insensibility is succeeded by prolonged sleep, which commonly ends in twenty-four or thirty-six hours, and is followed by nausea, vomiting, giddiness, and loathing of food.

2. The *habitual use of opium*, whether the drug be eaten or smoked, is undoubtedly in most cases injurious to the constitution, although probably not to the extent that some eastern travelers assert. Sir R Christison, and other eminent physicians, have shown that in numerous cases very large quantities of this drug may be regularly taken with impunity; and Dr. Chapman (*Elements of Therapeutics*, vol. ii., p. 199) relates two remarkable cases of this kind—one in which a wineglassful of laudanum was taken several times in the twenty-four hours, and another (a case of cancer of the uterus) in which the quantity of laudanum was gradually increased to *three pints* daily, a considerable quantity of solid opium being also taken in the same period.

Opium-smoking is a habit that is chiefly confined to China and the islands of the Indian archipelago. An extract, called *chandoo*, is made into pills about the size of a pea. The following is the account given by Marsden, in his *History of Sumatra*, of the process employed: "One of these pills being put into the small tube that projects from the side of the opium pipe, that tube is applied to a lamp, and the pill being lighted is consumed at one whiff or inflation of the lungs, attended with a whistling noise. The smoke is never emitted by the mouth, but usually receives vent through the nostrils." Although the immoderate practice of opium-smoking is most destructive to those who live in poverty and distress, yet from the evidence of Mr. Smith, a surgeon, resident at Pulo Penang, and of Dr. Eatwell, who passed three years in China, it does not appear that the Chinese in easy circumstances, and who have the comforts of life about them, are materially affected, in respect to longevity, by addiction to this habit.

3. As the discussion of the physiological action of opium on the different organs would, in its most condensed form, occupy too much space, we shall confine our remarks to the practical conclusions at which physiologists and physicians have arrived respecting the utility and the danger of prescribing this drug in various conditions of the principal vital organs.

a. Cerebro-spinal System.—Under proper regulations it is a remedy which may be used to stimulate the circulation within the cranium, to promote sleep, to diminish abnormal or increased sensibility, and to allay pain generally; while it is contra-indicated in apoplexy, cerebral inflammation, paralysis, and hysteria. Dr. Pereira relates a case in which *one grain* of opium, administered to an hysterical young woman, proved fatal.

b. Digestive System.—"Under proper regulations," says Pereira, "opium is an admissible remedy for the following purposes: to diminish excessive hunger; to allay pain, when unaccompanied by inflammation; to diminish the sensibility of the digestive organs in cases of acrid poisoning, and in the passage of biliary calculi; to produce relaxation of the muscular fibers of the alimentary canal in colic, and of the gall-ducts in the passage of calculi, and to diminish excessive secretion from the intestinal canal in diarrhea;" while it is contra-indicated "in diminished secretion from the gastro-intestinal membrane, in extreme thirst, in loss of appetite and weak digestion, in obstinate costiveness, and in diminished excretion of bile."

c. Vascular System.—In vascular excitement with great diminution of power, as after hemorrhage, opium is often serviceable; but when the pulse is strong as well as quick, or when there is simultaneously a tendency to abnormal sleepiness, it is contra-indicated.

d. Respiratory System.—"Opium, under proper regulations, may be useful to diminish the contractility of the muscles of respiration, or of the muscular fibers of the air-tubes, as in spasmodic asthma; to diminish the sensibility of the bronchia in the second stage of catarrh, and thereby to allay cough by lessening the influence of the cold air; and, lastly, to counteract excessive bronchial secretion;" while it is contra-indicated in difficulty of breathing, arising from a deficient supply of nervous energy, as in apoplectic cases; in cases in which the venous is imperfectly converted into arterial blood; and in the first stage of catarrh and pneumonia, both from its checking secretion, and from its tendency to impede the due arterialization of the blood.

e. Urinary System.—Opium is a valuable remedy to allay the pain in the kidney and adjacent parts in cases of renal calculi, and also to produce relaxation of the ureters when the calculi are passing along these tubes; it is also of great service in certain forms of irritable bladder.

There can be no doubt that the essential and primary operation of opium is on the nervous system, the other effects being for the most part secondary.

Opium is undoubtedly the most valuable remedy of the whole materia medica. "For other medicines," says Dr. Pereira, "we have one or more substitutes; but for opium, none—at least in the large majority of cases in which its peculiar and beneficial influence is required." We not only exhibit it to mitigate pain, to allay spasm, to promote sleep, to relieve nervous restlessness, to produce perspiration, and to check profuse discharges from the bronchial tubes and intestinal canal; but we also find it capable of relieving some diseases in which none of the above indications can be always distinctly perceived. In combination with tartar emetic, it has been strongly recommended in fever with much cerebral disturbance; in association with calomel, it is the most trustworthy remedy in cases of inflammation of membranous parts; in insanity, its value cannot be overestimated; it is the remedy chiefly trusted to in delirium tremens; it is more serviceable than any other medicine in diabetes; and to conclude with a more common and less serious affection, its efficiency, when administered in small doses (as ten or fifteen drops of laudanum three times a day), in promoting the healing of ulcers in which granulation proceeds too slowly, is very marked.

In addition to the solution of muriat of morphia (q.v.) which, on the whole, is the best preparation of opium for internal use in the majority of cases, the British pharmacopœia contains an opium pill (containing one part of opium in five of the pill); a pill of lead and opium (chiefly used in pulmonary hemorrhage); an aromatic powder of chalk and opium (containing one part of opium in forty of the powder); powder of ipecacuan and opium (or Dover's powder [q.v.], containing one part of opium in ten of the powder); powder of kino and opium (containing one part of opium in twenty of the powder, and, like the aromatic powder, chiefly used in diarrhea); tincture (see LAUDANUM), and camphorated tincture of opium (commonly known as paragoric elixir, and much used in chronic cough—containing two grains of opium in the fluid ounce); in addition to an enema; a wine (used chiefly as a local application to the eye in cases of ophthalmia); an ointment of galls and opium (used as an external application to piles); and a liniment and a plaster, which are applied to remove local superficial pains.

In a case of poisoning by opium, the first and most essential point is the evacuation of the contents of the stomach. The stomach-pump, if it can be procured, should be employed, and strong coffee should then be pumped into the stomach after the removal of its contents. The next best remedy is an emetic of sulphate of zinc (about a scruple), and if this is not at hand, a dessert-spoonful of flour of mustard, stirred up in a tumbler of warm water, will usually produce the desired effect. The patient must, if possible, be prevented from falling asleep, and for this purpose he should be kept constantly walking between two strong men, while a third person in the rear should, at short intervals, flick him sharply with a rough wet towel, or (if procurable) a good birch rod. Cold water should also be occasionally dashed over the head and chest. In a few apparently hopeless cases, death has been averted by artificial respiration, and by the application of electro-magnetism.

OPOBALSAMUM. See BALSAM and GUM.

OPODELDOC is a popular synonym for *soap liniment*. The origin of the term, which was apparently applied by Paracelsus to various forms of liniments or local applications, is not known. The *opo* is the same as the *opo* of *opoponax*, *opobalsamum*, etc.; and is doubtless derived from the Greek *ὀpos*, juice. It has been suggested by an eminent Anglo-Saxon scholar that the original word was *opodilla*, and that *doc* or *dock* was added merely as a gloss to *dilla*—a view that is confirmed by the fact, that in Ælfric's *Glossary*, *dill* (*dilla*) is Englished by *dock*. See LINIMENTS.

OPOP'ONAX, a gum resin obtained by puncturing the roots of a species of parsnip (*Pastinaca Opoponax*). The chief interest in this material is the great importance which the ancient physicians attached to it as an antispasmodic medicine. It was employed by Hippocrates, Theophrastus, and Dioscorides, who have each left descriptions of it. The plant grows generally throughout southern Europe, and the gum is still collected, but is not much used, except for the preparation of a well-known perfume.

OPOR'TO (Port. *O Porto*, the port), a city of Portugal, and, after Lisbon, the most important seaport of the country, in the province of Minho, on the right bank and two miles from the mouth of the Douro, in lat. 41°10′ n., long. 8° 38′ w.; and is 206 m. n.e. of Lisbon. Though possessing few imposing edifices, the town, seen from a distance with its irregular outline marked with many towers, its whitewashed houses gleaming among trees and terraced gardens, has a fine picturesque effect. Its picturesqueness, however, has been secured at the cost to a great extent of comfort, as many of its streets are narrow, dirty, and so steep as to be impassable for carriages. Of the old walls that surrounded the ancient town, remains are still to be seen. The principal street is the *Rua Nova dos Inglezes*, a spacious, handsome, modern thoroughfare, from which a good view of the bishop's palace, which seems to be hung high in the air, is obtained. Here is situated one of the finest edifices in Oporto, the English factory house, a building of white granite with a beautiful façade, and comprising on a magnificent scale all the appurtenances of a club-house, as ball-room, library, refreshment-room, etc. The houses in the *Rua Nova de S. João*, the most regular street in the city, are lofty, and are

faced with gaily painted and gilt balconies. Of the 11 squares, the greatest is the *Praça de S. Ovidio*, on a height, the appearance of which is enhanced by beautiful buildings and a terrace, with a fine seaward view, planted with trees. On the high rocks, on the southern bank of the river, stands the convent of *da Serra*, which at one time was extraordinarily rich. The most beautiful of the convents was that of *S. Bento*, now converted into barracks. The cathedral, which must originally have been a noble edifice, but has been infamously modernized, stands near the bishop's palace. The *Torre dos Clerigos* (Tower of the Clergy), said to be the highest in Portugal, was built in 1748. Formerly, there were in all 80 convents and chapels in the city. Of existing institutions, there are hospitals, and numerous educational and benevolent establishments. The city is provided with gas and electric lights, street railways and waterworks; and, in respect to the importance of its industries, ranks next to Lisbon among Portuguese cities. The principal industries are the spinning of cotton and wool, the manufacture of silk, hats, corks, soap, tobacco, brandy, metal ware, gold and jewelry, tanning, sugar refining and other important branches of industry. The entrance to the Douro is rendered highly dangerous by a shifting bar of sand; but yet the commercial traffic on the river is considerable. It is a very important commercial center, and in 1893 the value of its imports was 13,456,739 milreis (the official valuation of the milreis, according to the U. S. treasury report in 1897 being $1.08 in U. S. currency), and of its exports 11,684,449 milreis. The chief articles of import are wheat, rice, sugar, cotton, coal, manufactured articles, etc.; wine still continues the most important export, the next in extent being fruits, cork, cattle, wool, ores and onions. Great Britain and Brazil receive the largest shares of the exports. It is the seat of a bishopric, a military station, and of the northern naval department. Population of O. '90, 139,856.

In ancient times the site of Oporto was occupied by the harbor-town *Portus Cale*, afterwards *Porto Cale*, from which has been derived the name of the kingdom Portugal. It was an important city during the supremacy of the Moors, was destroyed in 820 by Almansor of Cordova, but was restored and peopled by a colony of Gascons and French in 999. It was famous for the strength of its fortifications during the middle ages, its walls being 3,000 paces in circumference, 30 ft. in height, and flanked with towers. From the 17th to the present century Oporto has been the scene of an unusual number of popular insurrections. In 1808 it was taken by the French; but in the following year it was retaken by an Anglo-Portuguese force under Wellington. In 1832, Dom Pedro, the ex-emperor of Brazil, was unsuccessfully besieged for a year in this city by the forces of Dom Miguel. In 1891 the troops quartered in Oporto proclaimed a republic, but the outbreak was speedily suppressed.

OPOS'SUM, *Didelphis*, a genus of *marsupiata*, having ten cutting teeth in the upper jaw and eight in the lower, one canine tooth on each side in each jaw, three compressed premolars, and four sharply tuberculated molars on each side—50 teeth in all; the tongue bristly; the tail long, prehensile, and in part scaly; the feet plantigrade; five toes on each foot, their claws long and sharp; but the inner toe of the right foot converted into a thumb, destitute of a claw, and opposable to the other digits; the muzzle long and pointed, the mouth very wide, the ears large and destitute of hair. The unwebbed feet and non-aquatic habits distinguish this genus from *cheironectes* (q.v.), also belonging to the family *didelphidæ*. But the genus *didelphis* itself is divided by some naturalists into several genera; and there are differences not unimportant, particularly in the well-developed pouch of some species, and the merely rudimentary pouch or abdominal folds of others. All the existing species are American, but fossil species are found in other parts of the world. The opossums were the first marsupial animals known, and are noticed as very wonderful creatures by some of the earliest writers on America. Some of the smaller species much resemble rats and mice, except in their long and pointed muzzle; others greatly resemble shrews; the largest known species are scarcely equal in size to a large cat. It is in some of the smaller species that the pouch is rudimentary; all the larger species have a well-developed pouch in which the young are carried, and to which, even after beginning to venture forth from it, they retreat on the approach of danger. The young of the species which have a merely rudimentary pouch, also remain attached to the nipple of the mother for a time; and afterwards for a time are carried on her back, intwining their prehensile tails with hers, and clinging to the fur of her back.—The Virginian Opossum (*D. Virginiana*) is one of the largest species. It abounds in the warmer parts of North America, and its range extends considerably to the n. of Virginia. Its form is robust, its head very large, its color dull white; its fur long, fine, and woolly, thickly interspersed with longer coarse white hairs, except on the head and some of the upper parts, where the hair is short and close. The tail is not quite so long as the body. The Virginian opossum lives much in forests and among the branches of trees, to which it usually retreats to devour its prey, twining its tail around a branch for security. Its food consists of small quadrupeds and reptiles, birds' eggs, and insects; also in part of fruits and the juicy stalks of plants. It often visits poultry-yards, and displays much cunning in its stealthy quest of prey; although otherwise it seems, like the other *marsupiata*, to be very low in the scale of intelligence. It seeks to escape from enemies by running to the woods and ascending a tree; but if escape is impossible, it feigns death, and maintains the imposture in very trying circumstances, however it may be kicked and beaten; but the true state of the case may be ascertained by throwing it into water. The American word *'possuming* makes a figurative application of this part of the natural history of the opossum. The female sometimes produces 16 young at a birth; the young when born are blind, naked, and shapeless, and weigh

scarcely more than a grain each; they do not begin to leave the pouch until they have attained about the size of a mouse. The female opossum shows a very strong attachment to her young. The opossum is very easily tamed, but its strong odor makes it an unpleasant pet. The flesh of the opossum is said to be good. The hair is woven into garters and girdles by the Indian women.—Other species of opossum are found in the more southern parts of America. Of these one of the largest is the CRAB-EATING OPOSSUM (*D. cancrivora*) of Guiana and Brazil, which is nearly as large as the Virginian opossum, lives chiefly in marshy places, and feeds much on crabs. The smaller species are numerous in the tropical parts of America.—The name opossum is often given in Australia to the phalangers (q.v.). See illus., MARSUPIALIA, vol. IX., figures 6, 7, 9, 10.

OPPELN, a t. of Prussia, province of Silesia, capital of the circle of the same name, on the Oder, 42 m. n.n.w. of Ratibor. Since 1816, when it was erected into an especial seat of government for upper Silesia, the town has been much beautified, both with new edifices and with parks and gardens. It contains several churches—one of which, Adelbert's church, was founded in 995—an old castle on the island Pascheke in the channel of the Oder, a town-house, and theater. Pop. '95 (including garrison), 23,018.

OPPENHEIM, a t. of the grand-duchy of Hesse, and capital of the circle of O., on the left bank of the Rhine, 15 m. w. of Darmstadt, and on the railway between Mayence and Spires. It stands on the steep slope of a hill abounding in vineyards, and carries on a pretty active trade in wine. Oppenheim occupies the site of the Roman castle of Bauconia, and was made a royal palatinate under the Carlovingians. It afterwards became one of the most important free towns of the empire. Pop. '95, 3550.

OPPERT, JULES, b. Hamburg, 1825; educated at Heidelberg, where he studied law, and at Bonn, where he devoted himself to Arabic and Sanskrit. His first work was a treatise on *The Phonetic System of the old Persians*. Being a Jew, and prevented on religious grounds from obtaining a position at a German university, he removed to France in 1847. He was professor of German in the lyceums of Laval and Rheims successively, and accompanied the expedition to Mesopotamia equipped by the French government. He returned in 1854, and has since made a special study of the cuneiform inscriptions. In 1857 he was appointed professor of Sanskrit in the imperial library at Paris, and in 1874, of Assyriology in the college of France. He published among other works: *The Inscriptions of the Achemenidæ* (1852); *Assyrian Studies; The French Scientific Expedition to Mesopotamia; A Sanskrit Grammar* (1859); *The Great Inscription of the Khorsabad Palace* (1864); *History of the Chaldean and Assyrian Empires, according to the Monuments* (1866); *The Immortality of the Soul among the Chaldeans, followed by translation of the Goddess Istar Astarte's Descent to Hell* (1875); *The People and Language of the Medes* (1879), etc.

OPPIAN, b. Cilicia, 2nd c., in the reign of Marcus Aurelius, or according to others in the reign of Severus. His father Agèsilaus, was a man of rank, who had his son instructed in the fine arts, geometry, and music. When Septimius Severus, who had usurped the throne, came to Anazarba, Oppian's birthplace, Agèsilaus was so intent upon his philosophical studies that he failed to pay his respects to the new emperor, who in consequence banished him to the island of Melita, in the Adriatic. His son Oppian accompanied him, and during his residence on the island finished his *Cynegetics*, or treatise on hunting, and *Halieutics*, or treatise on fishing. He then went to Rome, and offered both these poems to Antoninus Caracalla, the son of Severus, who was so pleased with them that he invited their author to ask any reward he pleased. Oppian contented himself with asking that his father might be released, and allowed to return to Cilicia. The emperor, besides granting this request, is said to have given him a piece of gold for every verse. Oppian went back to Cilicia, and died of the plague, at the age of 30. The *Halieutics*, written in hexameters, contain five books treating of fishes and fishing. The poem shows some zoölogical knowledge, though with many absurdities. The *Cynegetics* are in four books of hexameters, so inferior to to the *Halieutics* as to give rise to the supposition that they were composed by different persons. There is an English translation of the *Halieutics* by Draper and Jones, Oxford, 1722, and an English translation of the first book of the *Cynegetics* by Mawer, London, 1786.

OPPORTUNISTS, are that section of the Republican party in France who believe in being governed in political action by circumstances rather than by some previously established principle. The name was first applied to them during the exciting debates of the winter of 1874 and '75 when Gambetta (q.v.), who was their leader, was trying to effect certain measures. Since Gambetta's speech of February 12, 1875, "opportunism" has been the distinguishing policy of the entire Left, with the exception of a small minority known as "Intransigeants." See POLITICAL PARTIES, FRENCH.

OPPOSITION, the party in either house of the British parliament who are opposed to the existing government, and who would probably come into power on its displacement. The existence of a fair and temperate opposition, keeping a watch over the acts of the ministry, is undeniably conducive to good government; while, on the other hand, the conduct of public affairs may be seriously embarrassed by an opposition whose proceedings are conducted in a factious or obstructive spirit. The name opposition is not gen-

erally applied to a party, merely because opposed to the existing administration, if there is no likelihood of their succeeding to power on a change of government.

OPTIC NERVE. See Eye.

OPTIC, Oliver, pseudonym of Adams, William T. (q. v.).

OPTICAL ILLUSION. Of all the senses none is more deceptive than the sense of sight; it often deceives us as to the distance, size, shape, and color of objects; it frequently makes them appear as if in situations where their existence is impossible; and often makes us think them movable when they are not so, and *vice versâ*. An object appears to us as large or small, near or distant, according as the rays from its opposite borders meeting at the eye form a large or a small angle: when the angle is large, the object is either large or near; when small, the object must be small or distant. Practice alone enables us to decide whether an object of large apparent size is so on account of its real size, or of its proximity; and our decision is arrived at by a comparison of the object *in position*, with other common objects, such as trees, houses, etc., which may chance to be near it, and of which we have by experience come to form a correct idea. The same is, of course, true of apparently small objects. But when all means for comparison are removed, as when we see a distant object floating on an extensive sheet of water, or erect in an apparently boundless sandy plain, where no other object meets the eye, then our judgment is completely at fault. Imperfection in the acquired perceptions of sight, as it is called, produces many other illusions; it leads us to consider spherical solids at a distance as flat discs, and deceives us regarding the size of objects, by their color; the sun appears larger than he would if illumined by a fainter light, and a man in a white habit seems larger than he would if he wore a dark dress. Illusions are also produced by external causes; and instances of this sort are given under Mirage, Reflection, and Refraction.

The property which the eye possesses of retaining an impression for a very brief, though sensible period of time (about one-quarter of a second), after the object which produced the impression has been removed, produces a third class of illusions. Common examples of this are the illuminated circle formed by the rapid revolution of an ignited carbon point, piece of red-hot iron, or other luminous body, and the fiery curve produced by a red-hot shot projected from a cannon.

Another form of illusion is produced to a person who is seated in a vehicle in motion, and it is very deceptive when the motion is so equable as not to be felt by the person himself. The illusion is most complete when the attention is riveted on an object several yards off; this object then appears as a center round which all the other objects seem to revolve, those between the observer and the object moving backwards, and those beyond the object moving forwards. This illusion occurs on a large scale in the apparent motion of the heavenly bodies.

Other illusions arise from a disordered state of the organs of vision; such are the seeing of things double or movable (if they are not so), or of a color different from the true one; the appearance as of insects crawling on a body at which the eye is directed, etc.

OPTICS is the science whose object is the investigation of the laws that regulate the phenomena of light and vision. The nature of light will be found treated of under Light, and its various properties under Chromatics, Diffraction, Interference, Lens, Polarization, Reflection, Refraction, Spectrum, etc.; and we shall confine ourselves in this article to a historical sketch of the rise and progress of the science.

Optics, as a science, is entirely of modern growth, for though the Greeks and their disciples the Arabs had made some progress in mathematical optics, their knowledge was confined to the law of reflection and its more immediate consequences. Euclid, Aristotle, Archimedes, Hero, and Ptolemy were acquainted with the fact that light is transmitted in straight lines, but with the important exception of Aristotle, and some of his followers, the ancient philosophers believed that rays proceeded *from* the eye *to* the object, instead of in the contrary direction. Ptolemy was well acquainted with atmospheric refraction. Alhacen (1070) and Vitellio the Pole (1260) were almost the only cultivators of this science during the middle ages, and their additions to it were unimportant. The lens, though known from early antiquity, was not applied as an aid to defective eye-sight till after the time of Roger Bacon. Jansen, Metius, and Galileo separately invented the telescope about the beginning of the 17th c.; and the last-mentioned philosopher, by its means, made various important astronomical discoveries. Kepler, a short time after, gave the true theory of the telescope, explained the method of finding the focal length of lenses, and applied it to find the magnifying power of the telescope, besides pointing out the mode of constructing an instrument better adapted for astronomical purposes than that of Galileo; he also made some useful experiments on the nature of colors, and showed that images formed on the retina of the eye are inverted, a fact previously discovered by Maurolycus of Messina. From this period the science of optics steadily advanced, and its treasury of facts received numerous additions through the labors of De Dominis, Snell (the discoverer of the law of refraction in 1621), Descartes, Fermat, Barrow, Mariotte, and Boyle. Up to the time of Newton it was generally believed that color was *produced* by refraction, but that philosopher showed by a beautiful series of experiments that refraction only separates the colors already existing in white light. In his hands the theory and construction of the tele-

scope underwent many valuable improvements, and in 1672 the description of his *reflecting* telescope was submitted to the royal society. Gregory had constructed an instrument on similar principles some years before. About the same time, Grimaldi made his interesting series of experiments on the effects of diffraction, and noticed the remarkable fact of the interference of one pencil of light with the action of another. The complete theory of the rainbow, with an elegant analysis of the colors of thin plates, and the hypothesis concerning the nature and propagation of light, now known as the "corpuscular" theory, completed Newton's contributions to the science. The important services of the ingenious but eccentric Hooke cannot be easily stated in such a brief extract, as he discovered a little of everything, completed nothing, and occupied himself to a large extent in combating faulty points in the theories of his contemporaries. It must not, however, be forgotten that he has as much right as Huyghens to the credit of originating the undulatory theory, which is the favorite one at present. The double refraction of Iceland spar was discovered (1669) by Bartholin, and fully explained in 1690 by Huyghens, the propounder of the undulatory theory, who also aided the progress of mathematical optics to a considerable extent. The velocity of light was discovered by Römer (1675), and in 1720 the aberration of the fixed stars and its cause were made known by Bradley, who likewise determined with accuracy the amount of atmospheric refraction. Bouguer, Porterfield, Euler, and Lambert rendered essential service to physical optics; the same was done for the mathematical theory by Dollond (the inventor of the achromatic telescope), Clairaut, Dalembert, Boscovich, etc.; while in later times the experiments of Delaval on the colors produced by reflection and refraction; the discussion of the phenomena arising from unusual reflection or refraction, carried on by Vince, Wollaston, Biot, Monge, and others; the discovery of polarization of light by Malus (1808), and its investigation by Brewster, Biot, and Seebeck; of depolarization by Arago (1811), and of the optical properties as connected with the axes of crystals (1818) by Brewster; and the explanation of these and other optical phenomena, in accordance with the undulatory hypothesis by Young—the discoverer of the *interference* (q.v.) of rays—and Fresnel, went far to give optics a width of scope and symmetry which is possessed by few other sciences. The development of the undulatory theory and of optical science generally has been carried on in the present century by Lloyd, Airy, Cauchy, and others; and more recently important discoveries in connection with the physical modifications and chemical properties of light have been made (the latter chiefly, as far as the spectrum is concerned, by Kirchhoff), for a notice of which, and other discoveries, see PHOTOGRAPHY, SPECTRUM, and other articles.

OPTIMATES AND POPULARES, in the politics of republican Rome, were the conservative or aristocratic, and the democratic or progressive parties respectively. The *populares* comprised the great body of the people, including not only the proletariat but many men of wealth, but without personal influence. The *optimates* were the aristocracy, the great official houses, and their followers. The two parties perpetuated the old contests between the patricians and plebians. The *populares* triumphed under the leadership of C. Gracchus, and were crushed by Sulla.

OPTIMISM (Lat. *optimus*, best) the name given to the doctrine of those philosophers and divines who hold that the existing order of things, whatever may be its seeming imperfections of detail, is nevertheless, as a whole, the most perfect or the best which could have been created, or which it is possible to conceive. Some of the advocates of optimism content themselves with maintaining the absolute position, that although God was not by any means bound to create the most perfect order of things, yet the existing order *is de facto* the best; others contend, in addition, that the perfection and wisdom of almighty God necessarily require that his creation should be the most perfect which it is possible to conceive. The philosophical discussions of which this controversy is the development are as old as philosophy itself, and form the groundwork of all the systems, physical as well as moral, whether of the Oriental or of the Greek philosophy; of Dualism, Parsism, and of the Christian Gnosticism and Manicheism in the east; and in the west, of the Ionian, the Eleatic, the Atomistic; no less than of the later and more familiar, Stoic, Peripatetic, and Platonistic schools. In the philosophical writings of the fathers, of Origen, Clement of Alexandria, and above all of Augustine, the problem of the seeming mixture of good and evil in the world is the great subject of inquiry, and through all the subtleties of the mediæval schools it continued to hold an important and prominent place. But the full development of the optimistic theory as a philosophical system was reserved for the celebrated Leibnitz (q.v.). It forms the subject of his most elaborate work, entitled *Theodicea*, the main thesis of which may be briefly stated to be —that among all the systems which presented themselves to the infinite intelligence of God, as possible, God selected and created, in the existing universe, the best and most perfect, physically as well as morally. The *Theodicea*, published in 1700, was designed to meet the sceptical theories of Bayle, by showing not only that the existence of evil, moral and physical, is not incompatible with the general pefection of the created universe, but that God, as all-wise, all-powerful, and all-perfect, has chosen out of all possible creation the best and most perfect; that had another more perfect creation been present to the divine intelligence, God's wisdom would have required of him to select it; and that if another, even equally perfect, had been possible, there would not have been

any sufficient determining motive for the creation of the present world. The details of the controversial part of the system would be out of place in this work. It will be enough to say that the existence of evil, both moral and physical, is explained as a necessary consequence of the finiteness of created beings; and it is contended that in the balance of good and evil in the existing constitution of things, the preponderance of the former is greater that in any other conceivable creation. The great argument of the optimists is the following: If the present universe be not the best that is possible, it must be either because God did not know of the (supposed) better universe, or because God was not able to create that better one, or was not willing to create it. Now every one of these hypotheses is irreconcilable with the attributes of God: the first, with his omniscience; the second, with his omnipotence; and the third, with his goodness. See Leibnitz, *Theodicea;* Baumeister's *Historia de Mundo Optimo.* The view of the universe diametrically opposed to optimism is pessimism (*pessimus,* worst), and has of late been frequently maintained: see Sully's *Pessimism* (1877). See Pessimism.

OPUNTIA. See Prickly Pear.

O'PUS OPERAN'TIS (Lat. literally "the work of the worker"), a well-known theological phrase, intended to convey that the effect of a particular ministration or rite is primarily and directly due, not to the rite itself (*opus*), but to the dispositions of the recipient (*operans*). Thus, in the act of kissing or praying before a crucifix, of sprinkling one's self with holy water, of telling the prayers of the rosary upon blessed beads, the fervor and personal piety of the supplicant, and not the material object of the religious use, is held to be the efficient cause of the grace which is thereby imparted. The term is used chiefly by writers of the Roman Catholic schools, in whose system, however, the sacramental rites are held to differ from all others in this respect. See Opus Operatum.

O'PUS OPERA'TUM (Lat. literally "the work wrought") is the phrase employed in the Catholic theological schools to describe the manner of the supposed operation of the sacramental rites in the production of grace (q.v.). It is intended to imply that the ministration of the rite (*opus*) is in itself, through the institution of Christ, an efficient cause of grace, and that, although its operation is not infallible, but requires and presupposes certain dispositions on the part of the recipient, yet these dispostions are but *conditiones sine qua non,* and do not of themselves produce the grace; and hence, when the sacraments are administered to dying persons in a state of apparent insensibility, this is done in the hope and on the presumption that the dying person may, though seemingly unconscious, be nevertheless really disposed to receive the sacrament: but it is by no means held that if these dispositions be wanting, the sacrament will itself justify him. It is a mistake, therefore, to suppose, as is often done in popular controversy, that Catholics ascribe to the sacramental rites such magical or talismanic power that they can sanctify even an unrepentant sinner. Their efficacious operation *presupposes as conditions* the repentance and other moral dispositions of the recipient, although the grace which they give *is due not to these dispositions, but to the sacraments as received with the dispositions.*

OP'ZOOMER, Cornelis Willem, b. Holland, 1821; educated at Leyden, where he attacked Christianity in his *Examination of the Dutch Annals of Theology.* He was called to the chair of philosophy at the university of Leyden in 1846. His best known philosophical work is his *Path of Knowledge* (1851), in which he maintains rational empiricism. His chief journalistic work is *Elections Direct and Indirect.* D. in 1892.

OR, in heraldry, the metal gold, represented in heraldic engravings by an unlimited number of dots.

ORACHE, *Atriplex,* a genus of plants of the natural order *chenopodiaceæ,* having male, female, and hermaphrodite flowers; the male and hermaphrodite flowers with a 3–5 partite calyx, and 3–5 stamens; the female flowers with a compressed and 2-lobed or 2-partite calyx. The species are numerous. Some of them are of frequent occurrence in waste places, and as weeds in gardens in Britain and throughout Europe. Garden Orache (*A. hortensis*), also called Mountain Spinach, was formerly much cultivated in England, and is still cultivated in some parts of Europe as a substitute for spinach. It is a native of Tartary, an annual, with a stem about 3 ft. high, and cordate-triangular leaves, which are thick and glaucous, and have a slightly acid flavor. The leaves are sometimes greenish, sometimes reddish, which is the case also in other species, and the flowers resemble the leaves in color.—The leaves of the sea orache (*A. littoralis*), a native of the British coasts, are used in the same manner, and those of the common garden-weeds, *A. patula* and *A. angustifolia,* are excellent substitutes for spinach.—It is mentioned in Remy and Brenchley's *Journey to the Salt Lake City,* that an orache, with pale pink leaves and a salt taste, is cultivated by the Indians on the Humboldt river for its seed, which resembles that of Quinoa (q.v.), and is used like it for making porridge and bread.

ORACLE, the response delivered by a deity or supernatural being to a worshiper or inquirer; also the place where the response was delivered. These responses were supposed to be given by a certain divine afflatus, either through means of mankind, as in the orgasms of the Pythia, and the dreams of the worshipper in the temples; or by its effect on certain objects, as the tinkling of the caldron at Dodona, the rustling of the sacred

laurel, the murmuring of the streams; or by the actions of sacred animals, as exemplified in the Apis or sacred bull of Memphis, and the feeding of holy chickens of the Romans. This arose, in fact, from the idea that the deity signified his intentions to men by signs or inspirations, which, however, had always to be interpreted to the inquirer by the priesthood. Such responses were, however, closely allied to augury, which differed in this respect that auguries could be taken anywhere, while the oracular spots were defined and limited. Oracle dates from the highest antiquity, and flourished in the most remote ages, and gradually declined with the increasing knowledge of mankind. Among the Egyptians all the temples were probably oracular, although only a few are mentioned by Herodotus, as the oracle of Latona, in the city of Buto; those of Hercules, Mars, Thebes, and Meroe. In the hieroglyphic texts the gods speak constantly in an oracular manner, and their consultation by the Pharaohs is occasionally mentioned. In later days the most renowned of these oracles was that of Ammon, in the Oasis (q.v.), where oracular responses were rendered either by the shaking of the statue of the god, or by his appearance in a certain manner. Oracles were also used by the Hebrews, as in the consultation of the Urim and Thummim by the high priest, and the unlawful use of Teraphims, and consultations of the gods of Phenicia and Samaria. The Hebrew oracles were by word of mouth, as the speech of God to Moses, dreams, visions, and prophetical denunciations; besides which, there were oracles in Phenicia, as that of Belzebub and others of the Baalim. They were also in use throughout Babylonia and Chaldæa, where the responses were delivered by dreams given to the priestesses, who slept alone in the temples as concubines of the gods. So numerous were they in the ancient world, that 300 are said to have been in existence.

The most celebrated oracles of Asia Minor were those of Telmissus in Caria or Lycia, which gave responses by dreams, and that of Apollo at Patara; but the Grecian oracles enjoyed the highest reputation for truthfulness, and the most celebrated of these were the Dodonean, the Delphic, and that of Trophonius and Amphiaraus. The Dodonean (see DODONA) was the only oracle in Greece which was given by Jupiter; the others were either those of Apollo, or of certain soothsayers, to whom that god had imparted the gift of prophecy, or of other gods. The most renowned of all was the Delphic oracle (see DELPHI), and was Panhellenic, or open to all Greece, consulted for public purposes, and occupying a position resembling in some respects that of the papacy in the middle ages in Europe. The name of the first priestess who gave oracles was Phemonœ. The consultations were generally in the Delphic month, *Bysios* or April, and once a day on other months; and the precedence of consulting the oracle was determined by lot, but rich presents obtained for Crœsus and the Lydians the privilege of first consultation. Sacrifices were offered by the inquirers, who walked with laurel crowns on their heads, and delivered in sealed questions; the response was deemed infallible, and was usually dictated by justice, sound sense, and reason, till the growing political importance of the shrine rendered the guardians of it fearful to offend, when they framed the answers in ambiguous terms, or allowed the influence of gold and presents to corrupt the inspirations. The other oracles of Apollo were at Aba in Phocis; at Ptoon, where a man prophesied, which was destroyed in the days of Alexander the Great; and at Ismenus, s. of Thebes, Hysia, Tegyra, and Eutressis. In Asia Minor the most celebrated was that of Branchidæ, close to Miletus, celebrated in Egypt, Gryneum, and Delos. Besides that of Dodona, Zeus had another at Olympia; and those of various other deities existed elsewhere. A secondary class of oracles of heroic or prophetic persons existed in Greece, the two most celebrated of which were those of Amphiaraus and Trophonius. The first mentioned was one of the five great oracles in the days of Crœsus, and was situate at Oropus, in Attica, being the shrine of a deified magician, or interpreter of dreams, having a fountain close to it. Those who consulted it fasted a whole day, abstained from wine, sacrificed a ram to Amphiaraus, and slept on the skin in the temple, where their destiny was revealed by dreams. That of Trophonius was at Lebadea, in Bœotia, and owed its origin to a deified seer. It was given in a cave, into which the votary descended, bathed, and annointed, holding a honeyed cake. He obtained a knowledge of futurity by what he saw or heard, and returned dejected from the cavern. Then, seated upon the seat of Mnemosyne, he gave an account of what he had heard, and, conducted to the chapel of good fortune or good genius, recovered his usual composure. There were some other oracles of minor importance. Besides these oracles, written ones existed of the prophecies of celebrated seers, as Bacis and Musæus, which were collected by the Pisistratidæ, and kept in the acropolis of Athens. Those of the Euclus, Panolmus, and Lycus were also celebrated. Others of the Sibyls or prophetic women, daughters of Zeus and Lamia, were popular, and at a later period (see SIBYLS), Athenais and others, prophesied in the days of the Seleucidæ. Amongst the oriental nations, as the Arabs and others, divination was and is extensively practiced, but there are no set oracles. The Celtic Druids are said to have delivered responses, and the oracle of the Celtic god Belenus or Abelio, in the Isle de Sein, was celebrated. Herod. *Hist.* v. 89, viii. 82; Curtius, iv. 7; Hare, *Ancient Greeks*, (12mo, Lond. 1836, p. 141); Bos, *Antiquities of Greece* (1823, p. 31).

ORAN' (Arab. *Waran*), a thriving municipal t. and sea-port of Algeria, capital of the province of the same name, stands at the inner extremity of the gulf of Oran, 220 m.

w.s.w. of Algiers. The province of Oran, sometimes called the province of the west, from the fact of its forming the western frontier of the country, is bounded on the n. by the Mediterranean, on the e. by the province of Algiers, on the w. by the empire of Morocco, and on the s. by the desert. Area about 100,000 sq.m., of which 13,514 belong to the Tell (q.v.), and a large portion to the Sahara. Pop. '81, 767,322, four-fifths of whom were Arabs. The town of Oran is the seat of the government offices—the prefecture, the civil, criminal, commercial tribunals, etc. It also contains a college, primary and native schools, Protestant and other churches; synagogues; mosques; a branch of the bank of Algeria; exchequer, post, and telegraph offices; three great barracks, St. Philippe, le Château-Neuf, and le Château-Vieux; a military hospital, with accommodation for 1400 beds (an immense new building, which overtops all surrounding edifices), and various splendidly appointed magazines and government stores. The town, which is girt by walls, and defended by strongly armed forts, is seated at the foot of a high mountain, crowned by the forts Santa-Cruz and Saint-Gregoire. The port does not offer safe anchorage; although it has been much improved within recent years. Large vessels, however, have still to find shelter in the roadstead of Mers-el-Kebir, 3 m. distant. The streets and promenades of Oran are generally spacious, the houses elegant and airy. The principal edifices are the Château-Neuf, the residence of the general of division; the Hôtel de la Préfecture; the great mosque de la Rue Philippe; the Catholic church; and the barracks. Pop. of commune, comprising the three suburbs, Mers-el-Kebir, La Senia, and Aïn-el-Turk, '86, 67,681. The country in the vicinity is bare and arid, although the land is not sterile. To the s. of the town the country is uncultivated; but towards the s.e., highly cultivated lands are seen. In the vicinity there are a great many farms, cultivated with the greatest care, and most of them furnished with buildings necessary to their efficiency. Cattle are reared, and grain, tobacco, and cotton are grown. The vine already covers large tracts of land, and its cultivation is annually extending. It is cultivated with the most complete success, and the wines are of good quality.

Besides the commune of Oran, there are in the province the communes of Sidi-bel-Abbès, of Mostaganem (pop., 11,950), of Mascara (pop., 8,629), and of Tlemcen (q.v.).

The town of Oran was built by the Moors. It was taken by the Spaniards in 1509, by the Turks in 1708, and again by the Spaniards in 1732. In 1791 it was destroyed by an earthquake, and shortly after it was altogether abandoned by the Spaniards. Oran was taken by the French in 1831, has since remained in their hands, and has by them been developed into a large and prosperous town. Vessels with an aggregate tonnage of 65,000 tons enter and clear the port yearly. The annual imports amount to about $6,000,000, and the exports to $1,300,000.

ORANG, or ORANG-OUTANG, *Simia satyrus*, or *Pithecus satyrus*, or *P. Abelii*, a species of ape found in the forests of Malacca, Cochin-China, and some of the islands of that part of the world. The name is sometimes extended in signification, so as to include all the species of the restricted genus *simia* or *pithecus*, a genus which exists only in the s.e. of Asia and the eastern archipelago; and was also till of late extended even to the African apes now forming the genus *troglodytes*, the species which is the subject of this article being distinctively called the RED ORANG, when it and the chimpanzee were the only *anthropoid* apes known. The name orang is Malayan, and signifies *man* or *rational being;* outang signifies *wild*, or *of the woods*. The genus *simia* or *pithecus* differs from *troglodytes* (the chimpanzee and gorilla) in the more lengthened muzzle—the lower part of the face projecting suddenly and remarkably; in the very large canine teeth; in the great breadth of the central incisors; and in the great length of the arms, which are so long that the fingers can touch the ground when the animal stands erect. The ears are also small, and lie close to the head. The eyes are close together; the nose is little elevated; the lips are scarcely visible when the mouth is shut. The apes of this genus are arboreal in their habits, and not gregarious. They are ill-adapted for walking on the ground, and in a wild state probably almost never assume an erect posture, and although they can be taught to do it in confinement, they maintain it with difficulty, and only when standing still; even then often seeking to adjust the balance of the body by raising the arms above and behind the head. In climbing and swinging among the branches of trees, the hands of the hinder extremities are used as readily as those of the anterior, and the great length of the arms is useful in enabling them to take hold of distant branches. The fingers of all the extremities are very long.

Some of the most important distinctions between the anatomy of the anthropoid apes and that of man, are noticed in the article CHIMPANZEE. The orang and its congeners are regarded as differing more widely from man in their anatomical characters than the chimpanzee and gorilla; although the number of ribs is the same as in man, and there are a few other particulars in which the orang more nearly resembles a human being than any of the African apes do. The projecting muzzle is much less notable in the young than in the adult orang, and the aspect of the adult males is further rendered hideous by great callosities on the cheeks. In the adult state, the ridges of the skull also greatly increase in thickness and prominence.

The species of this genus exhibit in a much greater degree than those of *troglodytes* an anatomical character common also to many other apes and monkeys, a pouch in the

throat, opening from the windpipe, and capable of being dilated with air at the pleasure of the animal. In the orang, it branches into several subordinate pouches, which are situated among the muscles of the throat. The use of this organ is not known. It does not appear to have any connection with the voice; and has been supposed, not very probably, to be of some service in leaping, by diminishing the specific gravity of the animal.

There are at least two other species of the genus besides that best known as the orang, one of these being the great pongo (q.v.) of Borneo (*S.* or *P. Wormbii*), and the other (*S.* or *P. morio*), also a native of Borneo, of comparatively small size. The natural history of these apes has not been thoroughly investigated; and, until recently, it was supposed that the species first known might be identical with the great ape believed to exist in the woods, and that the differences of size and other characters might depend merely on age. The orang is about 3 ft. in length from the heel to the crown of the head. It is covered with brownish-red hair, which, on the back and arms, is 5 or 6 in. long, but very short on the backs of the hands and feet. There is little hair on the face, and none on the palms of the hands. When taken young, it is easily tamed, and becomes sufficiently familiar. It displays considerable sagacity, and some playfulness and love of mischief, but is not so frolicsome as many of the monkey tribe. Young specimens have sometimes been brought to Europe, but none have lived long. The temper is believed to change to the worse at maturity. See illus., MONKEYS, ETC., vol. X.

ORANGE, the name of one or more species of *citrus* (q.v.), of which the fruit is much prized. Botanists generally regard all the oranges as of one species, *citrus aurantium*, but some follow Risso in making the sweet orange, the bitter orange, the bergamot orange, etc., distinct species. The wild state of the orange is not certainly known, although its characters may be pretty confidently inferred from the degeneration of cultivated varieties; and no cultivated plant shows a greater liability to degenerate, so that seedling oranges are almost always worthless. Nor is its native country more certain, although there is much reason to believe that all the kinds have spread over the world from the warmer central and eastern parts of Asia. It has been alleged that the orange is a native of North America, near the gulf of Mexico; but the probability rather seems to be that it has been introduced, and has become naturalized.

The COMMON ORANGE, or SWEET ORANGE (*citrus aurantium* of Risso), is an evergreen tree of moderate size, with greenish-brown bark; the leaves oblong, acute, sometimes minutely serrated, the leaf-stalks more or less winged, the flowers white, the fruit roundish, the oil-cysts of the rind convex, the juice sweet and acid. It is cultivated in almost every part of the world of which the climate is warm enough, but succeeds best in the warmer temperate or sub-tropical climates, as in the s. of Europe, where it is very extensively cultivated, as far n. as the s. of France. The orange does not seem to have been known to the Greeks or Romans, but was probably brought to Europe by the Moors, and is supposed to have been introduced into Italy so recently as the 14th c., fully 1000 years after the citron. In the n. of Italy, oranges are sometimes grown in conservatories, but often in the open air, except during winter, when they are covered with temporary houses of boards. In the s. of England they are sometimes in like manner grown in the open air, with a shelter of boards or matting in winter, but trained against a south wall; attaining a large size, and yielding good fruit. The abundant importation of the fruit, however, renders the cultivation of the orange in Britain unnecessary; and, in general, only small plants are to be seen in green-houses or conservatories, as mere objects of interest. In former times, when the evergreen shrubs in cultivation were much fewer than now, orange trees were very commonly cultivated in pots, both in green-houses and in windows of apartments in Britain, as is still the case in the northern parts of Germany. The orange loves a rich soil, and succeeds well in a strong clay. There are many varieties in cultivation, which are perpetuated by grafting upon seedling orange stocks, and by layers.

Of the varieties of the sweet orange, perhaps the most deserving of notice are the PORTUGAL or LISBON ORANGE, the most common of all, having the fruit generally round or nearly so, and a thick rind; the CHINA ORANGE, said to have been brought by the Portuguese from China, and now much cultivated in the s. of Europe, having a smooth thin rind and very abundant juice; the MALTESE or BLOOD ORANGE, remarkable for the blood-red color of its pulp; the EGG ORANGE, having fruit of an oval shape; and the TANGERINE ORANGE, having a small flat fruit, with a pleasant odor and finely flavored pulp. The ST. MICHAEL'S ORANGE appears to be a sub-variety of the China orange. The MAJORCA ORANGE is seedless, resembling in this certain cultivated varieties of other fruits.

The BITTER ORANGE, SEVILLE ORANGE, or BIGARADE (*citrus vulgaris*, or *C. bigaradia*), is distinguished from the sweet orange by the more truly elliptical leaves, the acid and bitter juice of the fruit, and the concave oil-cysts of its rind. Its branches are also spiny, which is rarely the case with the sweet orange. The varieties in cultivation are numerous. The bitter orange was extensively cultivated by the Moors in Spain, probably for medicinal purposes. The rind is more bitter than that of the sweet orange, and is used as a stomachic and tonic. Its chief use, however, is for flavoring puddings, cakes, etc., and for making marmalade.

The BERGAMOT ORANGE (*C. bergamia*) is noticed in a separate article.

The MANDARIN ORANGE, or CLOVE ORANGE (*C. nobilis*), recently introduced from China, has fruit much broader than long, with a thick rind, very loosely attached to the flesh, so that there is often a space between them. The leaves are smaller than those of any other kind of orange.

Orange leaves are feebly bitter, and contain a fragrant volatile oil, which is obtained by distilling them with water, and is known in the shops as *essence de petit grain*. Orange flowers yield, when distilled with water, a fragrant volatile oil, called *oil of neroli*, which is used in making *eau de cologne*, and for other purposes of perfumery. The flowers both of the sweet orange and of the bitter orange yield it, but those of the bitter orange are preferred. Dried orange flowers, to be distilled for this oil, are an article of export from the s. of Europe. They are packed in barrels, and mixed with salt. The dried flowers have a yellowish color; the fresh flowers are white and very fragrant. The use of them as an ornament in the head-dress of brides is common throughout great part of the world. The small green oranges, from the size of a pea to the size of a cherry, which fall from the trees, both of the sweet orange and the bitter orange, when the crop is too great to be brought to maturity, are carefully gathered and dried, and are the *orange berries* of the shops. They are used in making curaçoa. They also yield a fragrant oil on distillation, the original *essence de petit grain;* and they are smoothed in a turning-lathe, and employed as *issue pease;* not readily acquiring a fetid ordor, as pease do when employed for this purpose. The dried and candied rind of the ripe bitter orange, well known as *orange-peel*, is used as a stomachic, and very largely for flavoring puddings and articles of confectionery. The rind of the sweet orange is sometimes employed in the same way, but is inferior. A fragrant essential oil is obtained from the rind of the orange by distillation with water, and is sold by perfumers as *oil of sweet orange*, or *oil of bitter orange*, according as it is obtained from the one or the other, although the two kinds of oil are very similar. The rind of the orange is used in the preparation of a fine liquor called *orange rosoglio*, which is an article of export from some parts of Italy. Besides the use of the sweet orange as a dessert fruit, and as a refrigerant in cases of sickness, its juice is extensively used as a refrigerant beverage, and is particularly valuable in febrile and inflammatory complaints.

Orange trees are often extremely fruitful, so that a tree 20 ft. high, and occupying a space of little more than 12 ft. in diameter, sometimes yields from 3,000 to 4,000 oranges in a year. The orange tree attains an age of at least 100 to 150 years. Young trees are less productive than old ones, and the fruit is also less juicy, has a thicker rind, and more numerous seeds.

The wood of the orange tree is yellowish-white and close-grained. It is used for inlaying and for turnery.

The fruit of the orange tree is of great commercial importance, for not only is it one of the most delicious and wholesome of fruits, but fortunately it is also the most easily kept and carried from place to place No fresh fruit possesses in the same degree as the orange, and its congeners, the lemon, citron, lime, etc., the property of being easily packed in boxes, when nearly ripe, and being in that state able to stand the close confinement of a ship's hold during a voyage of two or three weeks. The orange is much cultivated in the Azores, Malta, Sicily, Spain, and Portugal, and it is from these localities that Britain receives its supply. Those from St. Michael's, one of the Azores, and from Malta, are the best varieties in our markets; but the *mandarin orange* of China and the navel orange of South America are much superior. The latter occasionally reach this country in small quantities from Brazil; they are nearly double the size of the ordinary orange, and have a peculiar navel-like formation on the top of the fruit, which is somewhat oval in shape. The very small orange, now often seen in our shops, with an extremely aromatic rind, is the Tangerine orange, of which there are two varieties—the greater and lesser. The latter is hardly an inch in diameter, but the flesh is sweet, and the rind deliciously fragrant. The larger variety is about half the size of a common orange, and is the one generally seen.

The bitter orange is called the Seville orange in consequence of large plantations, which the Moors planted round the city of Seville, having for a long time furnished the chief part of those used in this country; but it also has several varieties, which are all remarkable for the bitterness of the rind, and the not very pleasant sharpness of the juice. Their chief use is for making the well-known confection called orange marmalade, and for this the true *large-fruited* variety is the best, but it is now somewhat scarce.

Oranges, when gathered for export, must not be quite ripe; those fully formed, and with the color just turning from green to yellow, are chosen. Each is wrapped in a piece of paper, or in the husk of Indian corn, and they are packed in boxes and half-boxes, chests and half-chests—the former are the Sicilian packages, the latter are St. Michael's, Spanish, and Portuguese. A box contains about 250, a chest about 1000 oranges; and the price ranges from 15s. to 30s. per box, and from 30s. to 50s. a chest. The crop begins to arrive early in November, and the ships continue to bring them until the spring. The quantity consumed in Great Britain alone is enormous; and since the duty was removed, has reached nearly two millions of bushels annually.

Orange-peel, or the rind of the orange, is used both in medicine and in confectionery —for the former purpese, it is merely cut into long strips, and dried; for the latter, it is carefully separated, either in halves or quarters, from the fruit, and after lying in salt

water for a time, is washed in clear water, and then boiled in syrup of sugar, or candied, and is sold extensively as candied peel. The rinds of the citron and lemon are treated in the same manner.

The orange is a fruit cultivated in Florida, Texas, Louisiana, southern California, and some other states. In Florida there are extensive groves of wild oranges, which are of use in budding other varieties, and the cultivation of the orange is an important industry. In Florida three methods of establishing an orange grove are in use. Either stocks are raised from seed, budded in a nursery, and set out when of proper size; or young wild trees are transplanted and budded; or a wild grove is cleared, and budded with sweet fruit. See illus., TEA, COFFEE, ETC., vol. XIV.

ORANGE, a co. in southern Cal., on the Pacific ocean, formed, 1889, from part of Los Angeles; 740 sq.m.; pop. '90, 13,589. Co. seat, Santa Ana.

ORANGE, a co. in central Florida, bounded on the n.e. by St. John's river; 1566 sq.m.; pop. '90, 12,584, inclu. colored. The surface is even, and much of it covered with swamp, lakes, and great forests of pine. The soil is sandy. Cattle grazing is the principal pursuit, and large numbers of cattle are raised and exported. Co. seat, Orlando.

ORANGE, a co. in s. Indiana, drained by Lost creek and Patoka creek, on the Louisville, New Albany and Chicago railroad; 400 sq.m.; pop. '90, 14,678, chiefly of American birth. The surface is undulating, and in the s. hilly. The soil is fertile, and produces good crops of corn, wheat, oats, tobacco, and potatoes. There are flour and saw mills, and manufactories of whetstones and harnesses. Co. seat, Paoli.

ORANGE, a co. in s.e. New York, adjoining New Jersey, bounded e. by the Hudson and s.w. by the Delaware; drained by the Shawangunk, Wallkill, and Ramapo rivers; traversed by the Erie and the Lehigh and New England railroads; 791 sq. m.; pop. '90, 97,859, chiefly of American birth. The surface is diversified, much of it occupied with the Hudson highlands, and contains iron, granite, and limestone. The soil is fertile, and produces good crops of corn, grass, oats, and potatoes. It is one of the best dairy-farming districts in the state, and produces immense quantities of milk and butter. West Point is in this county. Co. seat, Goshen.

ORANGE, a co. in n. central North Carolina, drained by New Hope creek and the Neuse, Flat, and Haw rivers, on the Southern railroad; about 380 sq. m.; pop. '90, 14,958, chiefly of American birth. The surface is undulating and heavily wooded, and the soil generally fertile. The great staple is tobacco. Corn, wheat, oats, potatoes, sweet potatoes, and cotton are also raised. Sandstone is abundant. Co. seat, Hillsboro.

ORANGE, a co. in e. Texas, adjoining Louisiana, bounded on the e. by the Sabine river, on the s. by Sabine lake, and on the w. by the Neches river; 396 sq. m.; pop. '90, 4770. The surface is mostly even, well wooded in some portions. The soil is fertile, and adapted to agriculture or grazing. The principal productions are corn, sweet potatoes, and cotton. Rice grows well on the wet lands. Many cattle are raised. Co. seat, Orange.

ORANGE, a co. in e. Vermont, drained by the White river and Wait's river, on a branch of the Boston and Maine railroad; 659 sq. m.; pop. '90, 19,575, chiefly of American birth. The surface is diversified and hilly, and much of it heavily wooded with beech, maple, elm, and other trees. Copper and slate are found. The soil is fertile, and produces good crops of corn, oats, hay, and potatoes. The sugar maple abounds, and much maple sugar is made. Other staples are wool and butter. There are flour, saw, and woolen mills, and manufactories of carriages and agricultural tools. Co. seat, Chelsea.

ORANGE, a co. in n. central Virginia, s. of the Rapidan river, intersected by the North Anna; on the Potomac, Fredericksburg and Piedmont, the Chesapeake and Ohio and the Southern railroads; 360 sq. m.; pop. '90, 12,814, includ. colored. The surface is uneven and heavily wooded. The soil is fertile, and the principal productions are corn, wheat, and oats. Co. seat, Orange.

ORANGE (the ancient *Arausio*), a city and commune of France, in the department of Vaucluse, cap. of arrondissement, stands in a beautiful plain on the left bank of the Aigue, 18 m. by railway n. of Avignon. Its chief manufactures are silks, muslins, serges, etc.; and there are numerous oil-works, dye-works, and tanneries. It carries on a considerable trade in wine, spirits, oils, truffles, saffron, honey, madder, and essences. Pop. '91, 9900.

Orange was the capital of a small independent principality of the same name (now comprised in the department of Vaucluse), which was ruled by its own sovereigns from the 11th to the 16th century. The last of these sovereigns, Philibert de Chalons, died in 1531 without issue. His sister, however, had married a count of Nassau, and to that house the estates and titles passed. The count of Nassau who obtained the principality of Orange was William, the father of William I., the stadtholder of the United Provinces (see WILLIAM, PRINCE OF ORANGE). William III., prince of Orange and king of England, having died in 1702 without issue, there began a long-continued controversy as to the succession between Frederick I. of Prussia (as grandson of one of the last princes of Orange), the representative of the older branch of the house of Nassau (q.v.), and the

head of the younger line. At the peace of Utrecht (1713) the king of Prussia took the settlement into his own hands, so far as the territory of Orange was concerned, by making it over, for certain equivalents, to the king of France. The title, prince of Orange, remained with the younger Nassau line, afterwards kings of the Netherlands, and is now borne by the heir-presumptive to the Dutch throne.

In the vicinity of Orange are several notable Roman remains. The triumphal arch, 60 ft. high, is celebrated for the beauty of its architecture, and for its richly sculptured *bassi-rilievi*. Of the theater, the remains are sufficiently entire to give a good idea of the arrangements of this institution as it existed among the Romans.

ORANGE, a town in Franklin co., Mass.; on Miller river and the Fitchburg railroad; 19 miles e. of Greenfield. It was incorporated in 1783; contains several villages, national and savings banks, public library, high school, and electric light plant; and is principally engaged in the manufacture of sewing machines, woolen machinery, turbine water wheels, and furniture. Pop. '90, 4,568.

ORANGE, a city in Essex co., N. J.; on the Delaware, Lackawanna, and Western, a branch of the Erie, and electric railroads connecting with Newark, Bloomfield, East Orange, and South Orange; 4 miles n.w. of Newark. It was originally a part of Newark, settled in 1666, was incorporated as a township in 1806, and was chartered as a city in 1870. The surface rises from East Orange to the summit of the first range of mountains, and among the picturesque spots in its vicinity are Llewellyn park, comprising 750 acres, and occupied by many costly residences; Eagle rock (West Orange), on the e. brow of the mountain, 650 feet above tide-water, and now included in the new public park system of Essex co.; and Hemlock falls (South Orange), one of the wildest of mountain attractions. The city is lighted by gas and electricity, and has modern sewerage and water systems. It is noted as a residential place, containing the homes of many New York business men, and, from its elevated suburbs, commands magnificent views of the surrounding country and the waters of New York. In the city and its vicinity are many miles of excellent roads. The noteworthy buildings include music hall; Orange memorial hospital, with Shepard pavilion and a training school for nurses; orphan home; house of the Good Shepherd; Y. M. C. A.; W. C. T. U.; Masonic temple; and the First Presbyterian church, originally built in 1719, and several times remodeled. The city has a public library, an effective bureau of associated charities, a widely known Mendelssohn union, an active New England society, woman's club, Essex county hunt with commodious quarters, and many athletic and social clubs. Probably for its size Orange contains more modern-built churches than any other city in the country. Pop. '90, 18,844.

ORANGEBURG, a co. in s.w. South Carolina, bounded on the n.e. by the Congaree and Santee rivers, and on the s.w. by the Edisto; on the South Carolina and Georgia and the Atlantic Coast Line railroads; 1400 sq. m.; pop. '90, 49,393 includ. colored. The surface is diversified and the soil fertile. The principal productions are corn, wheat, rice, cotton, and sweet potatoes. Co. seat, Orangeburg.

ORANGE COLORS, for painters' use, are various shades of alteration produced on chrome yellow (see YELLOW COLORS), by acting on it either with diacetate of lead or a weak alkaline lye, both of which redden the otherwise pure yellow, and give it an orange tint.—For dyers, a beautiful orange red is obtained from safflower; and orange yellows are made by mixing, in proper proportions, any of the red with the yellow dyes.

ORANGE FREE STATE. The Orange Free State is the name assumed by the republic of Dutch boers, who, after retiring from Natal when declared a British colony, established themselves in the country lying between the two great branches of the Orange river, the Ky Gariep and the Gariep, known to the colonists as the Vaal and Orange rivers, and separated from the coast region by the great chain of the Quathlamba, Maluti, and Drachenberg mountains.

The Orange Free State forms a sort of connecting link between the Cape Colony, the Transvaal Territory, and Natal. It consists chiefly of vast undulating plains, which slope down from the Maluti mountains to the Vaal river, dotted over here and there with rocky hills, locally called "Kopjies," although in the northern part hundreds of square miles are found with hardly a break on the horizon. The climate is very healthful, and in the upland regions, considering the latitude, remarkably cool.

The area is estimated at 48,326 sq. miles, and, according to the census of 1890, the white population numbered 77,716, of whom 51,910 were born in the Free State and 21,116 came from the Cape Colony. The natives in the state at that time numbered 129,787. The capital and most important town is Bloemfontein, with a population in 1890, of 3,459, of whom 2,077 were whites. There is a considerable immigration, especially from Germany and India.

All the rivers of this region are affluents of either of the branches of the Gariep; amongst them may be named the Modder, Valsch, Great and Little Vet, which run into the Ky Gariep or Vaal river, and the Caledon, a considerable stream, which joins the Orange river after draining the Basuto country.

This region is a vast plateau, rising from 3,000 to 5,000 ft. above the sea-level, with very little wood, except along the lines of the water-courses that traverse it. Travelers crossing this state from the Cape Colony to Natal arrive at the top of the passes leading to the latter colony without a mountain being in sight, and then find themselves suddenly

on the edge of an immense mountain-chain, with the coast region several thousand feet below them, extending to the Indian ocean. Immense herds of the larger antelopes formerly tenanted these vast plains, and are vividly described by capt. Harris, Gordon Cumming, and others; they are now fast disappearing. The diamond-fields recently discovered lie in this state, partly in Griqualand West, now British territory.

In parts of the country the land is very fertile, but by far the greatest portion of the surface is devoted to grazing, and consists of undulating plains. The farms accordingly are of great size. Of the live stock, sheep are the most important. Diamonds have been found in considerable quantities as well as garnets and other precious stones, and rich coal mines occur in the country. Gold is also found to some extent.

The Orange Free State has a republican form of government, with a legislative assembly and a president. The members of the former are chosen by vote of the adult white males for four years, but one-half retire every two years and a new election takes place. The qualifications for suffrage involve the ownership of real property or the possession of a specified yearly income, and the suffrage is not extended to the blacks. The president is chosen by universal suffrage for a term of 5 years and is aided in the execution of the laws by an executive council. The chief religious body is the Dutch Reformed Church with 68,940 members. The next in the order of numerical importance, though falling far below this body, are Episcopalians, Wesleyans, Roman Catholics, Lutherans and Jews. The government contributes money for religious purposes. There is a national system of education and the government schools are under the administration of local school boards. Under certain conditions grants are made by the government to private schools. The legal code prevailing is the Roman Dutch. The superior courts are the high courts of justice and the circuit courts. There is a police constabulary in the towns and mounted police patrol the rural districts. The revenue is derived from quit rents, transfer dues, import dues, posts and telegraphs, stamps, and a poll-tax. In emergencies the male population, between sixteen and sixty years of age, can be required to take arms in the service of the state.

The history of the country forming the Free State may be summed up in a few words. Capt. Harris describes it, before 1836, as a howling wilderness, inhabited by wandering hordes of Bushmen and broken tribes of Betjouana and Zulu refugees from the armies of the great Zulu tyrants, Chaka, Dingaan, and Maselikutse. After the Kaffir war of 1835–36, a spirit of dissatisfaction arising in the minds of many of the frontier boers, an extensive emigration took place along the n.e. frontier of the Cape Colony; the majority of the emigrants, however, having Natal as their ultimate goal. However, after the British government had declared it an English colony in 1843, the boers again fell back on this region, and by degrees declaring their independence of the British crown, and forming a sort of Alsatia on the English borders, after some opposition, and one or two conflicts with home troops, the country was annexed by sir H. Smith to the British empire, under the name of the Orange River sovereignty; and continued so until 1854, when sir G. Clerk formally gave it up, and allowed the inhabitants to form a government according to their own wishes. The government is now in the hands of a president, freely elected by the landrost and heemraden in the several districts; while the volksraad, or peoples' council, exercise legislative functions. This state labors under the very serious disadvantage of being, like the kingdom of Bohemia, entirely inland, and has no port on the ocean at which customs dues can be collected; thus throwing the whole of the expense of government on local taxation.

About the year 1862 a large number of Griquas—a tribe of bastard Hottentots, who inhabited the south part of the state—sold their farms to the Free State government, and migrated in a body to the coast side of the mountains in Independent Kaffraria, occupying a large tract of country there known by the name of No Man's Land.

In 1866 a treaty was concluded with Moshesh, chief of the Basutos, by which a portion of the territory known as Basuto Land was ceded to the Orange River Free State. The boundaries agreed on by this treaty were, however, somewhat modified by the governor of Cape Colony in 1869—a significant fact.

The Boers being the chief element in the population, the Free State has naturally been in strong sympathy with the neighboring republic of the Transvaal, and in 1896 a closer union between the two Dutch republics in South Africa was under discussion.

OR'ANGEMAN, one of the unhappy party designations which contributed for nearly a century to create and keep alive religious and political divisions of the worst character throughout the British empire, but especially in Ireland. The Orange organization had its origin in the animosities which had subsisted between Protestants and Catholics in Ireland from the reformation downwards, but which reached their full development after the revolution of 1688, and the wholesale confiscations of Catholic property by which that event was followed. From that time, the Catholics of Ireland may be said legally to have lost all social, political, and religious status in Ireland. Some attempts which were made in the latter part of the 18th c. to ameliorate their condition, excited, especially in the n., the alarm of the Protestant party, who regarded the traditionary "Protestant ascendency" as endangered. Acts of violence became of frequent occurrence, and, as commonly happens, combinations for aggressive and defensive purposes were formed, not alone by the Protestants, but also by their Catholic antagonists. The members of the Protestant associations appear at first to have been known by the name of "Peep-of-day Boys," from the time at which their violences were commonly perpetrated; the Catholics

who associated together for self-defense being called "Defenders." Collisions between armed bodies of these parties became of frequent occurrence. In 1785 a pitched battle, attended with much bloodshed, was fought in the county of Armagh. The steps taken to repress these disorders were at once insufficient in themselves to prevent open violence, and had the effect of diverting the current into the still more dangerous channel of secret associations. The rude and illiterate mob of Peep-of-day Boys made way for the rich and influential organization of the Orange society, which, having its first origin in the same obscure district which had so long been the scene of agrarian violence, by degrees extended its ramifications into every portion of the British empire, and into every grade of society from the hovel to the very steps of the throne. The name of the Orange association is taken from that of the prince of Orange, William III., and was assumed in honor of that prince, who, in Ireland, has been popularly identified with the establishment of that Protestant ascendency which it was the object of the Orange association to sustain. The first "Orange lodge" was founded in the village of Loughgall, county Armagh, Sept. 21, 1795. The immediate occasion of the crisis was a series of outrages by which Catholics were forcibly ejected from their houses and farms, 12 or 14 houses being sometimes, according to a disinterested witness, wrecked in a single night; terminating, Sept., 1795, in an engagement, called from the place where it occurred, the Battle of the Diamond. The association which began among the ignorant peasantry soon worked its way upwards. The general disaffection towards English rule, which at that time pervaded Ireland, and in which the Catholics, as a natural consequence of their oppressed condition, largely participated, tended much to identify in the minds of Protestants the cause of disloyalty with that of popery; and the rebellion of 1798 inseparably combined the religious with the political antipathies. In November of that year, the Orange society had already reached the dignity of a grand lodge of Ireland, with a grand master, a grand secretary, and a formal establishment in the metropolis; and in the following years, the organization extended over the entire province of Ulster, and had its ramifications in all the centers of Protestantism in the other provinces of Ireland. In 1808 it extended to England. A grand lodge was founded at Manchester, from which warrants were issued for the entire kingdom. The seat of the grand lodge was transferred to London in 1821. The subject more than once was brought under the notice of parliament, especially in 1813; and, in consequence, the grand lodge of Ireland was dissolved; but its functions in issuing warrants, etc., were discharged vicariously through the English lodge. The most memorable crisis, however, in the history of the Orange society was the election of a royal duke (Cumberland) in 1827 as grand master for England; and on the re-establishment of the Irish grand lodge in 1828, as imperial grand master. The Catholic relief act of the following year stirred up all the slumbering antipathies of creed and race, and the Orange association was propagated more vigorously than ever. Emissaries were sent out for the purpose of organizing lodges, not alone in Wales and Scotland, but also in Canada, in the Mediterranean, and in the other colonies. But the most formidable part of this zealous propagandism was its introduction into the army. As early as 1824 traces of this are discoverable, and again in 1826. No fewer than 32 regiments were proved to have received warrants for holding lodges in Ireland, and the English grand lodge had issued 37 warrants for the same purpose.

The organization of this strange association was most complete and most extensive. Subject to the central grand lodge were three classes—county, district, and private lodges—each of which corresponded and made returns and contributions to its own immediate superior, by whom they were transmitted to the grand lodge. Each lodge had a master, deputy-master, secretary, committee, and chaplain. The only condition of membership was that the party should be Protestant, and 18 years of age. The election of members was by ballot, and each lodge also annually elected its own officers and committee. The general government of the association was vested in the grand lodge, which consisted of all the great dignitaries, the grand masters of counties, and the members of another body called the grand committee. This lodge met twice each year, in May and on Nov. 5—the day pregnant with associations calculated to keep alive the Protestant antipathies of the body. All the dignitaries of the society as well as its various committees and executive bodies, were subject to annual re-election. In 1835 the association numbered 20 grand lodges, 80 district lodges, 1500 private lodges, and from 200,000 to 220,000 members. The worst result of the Orange association was the constant incentive it supplied to party animosities and deeds of violence. The spirit of fraternity which pervaded its members was a standing obstacle to the administration of the law; and all confidence in the local administration of justice by magistrates was destroyed. An alleged Orange conspiracy to alter the succession to the crown in favor of the duke of Cumberland led to a protracted parliamentary inquiry in 1835; and this inquiry as well as a shocking outrage perpetrated soon afterwards by an armed body of Orangemen, on occasion of a procession in Ireland, so discredited the association and awakened the public mind to a sense of its folly and wickedness, that its respectability has since that time gradually diminished. For several years the lord chancellor laid down a rule, by which no member of the Orange association was admitted to the commission of the peace; and the association became comparatively without influence, except among the very lowest classes in the north of Ireland. Of the colonial offshoots of the Orange association those

of Canada have at all times been the most active, carrying with them all the bitterness of the domestic feud with the Roman Catholics. Outrages against Catholic churches and convents were of not unfrequent occurrence until recently; and on occasion of the visit of the prince of Wales to Canada, an attempt was made to force from his royal highness a recognition of the association, which was only defeated by his own firmness, and by the judicious and moderate counsels of his advisers. A few years ago the Orangemen of British America constituted above 1200 lodges, with about 150,000 members. The association has branches in the United States also. In 1870, a picnic party of Orangemen in New York City were attacked by a mob of workmen, rendered furious, it is said, by hearing the band play "Boyne Water." Three persons were killed. The next year, a procession of Orangemen, escorted by a body of policemen and several regiments of soldiers, was attacked by a crowd of rioters, and though the contest was very short, it resulted in the death of two soldiers, and twenty-six wounded, while of the rioters, there were thirty-seven killed and sixty-seven wounded. "Orange Day" is July 12th.

ORANGE OIL, an essential oil obtained by distilling or pressing the rind of the orange. It is composed principally of the hydrocarbon *hesperidene,* C_{10} H_{16}. It changes rapidly on exposure to the air, acquiring a turpentine-like odor, the occurrence of which is prevented or retarded by the addition of 5 or more per cent of alcohol. It commences to boil at 347°F., and 97.8 per cent goes over below 356°. The remainder is a soft, inodorous, yellow resin. *The oil of orange flowers, or oil of neroli,* is a volatile oil of a very agreeable odor, and much used in perfumery. It is usually obtained in the preparation of orange flower water, separating upon the surface in small quantities. It has a brownish color, a bitterish, aromatic taste, and a density of 0.889. It is neutral to test paper, and shows a bright violet fluoresence when mixed with alcohol. On being shaken with a concentrated solution of bisulphite of sodium it assumes an intense permanent crimson hue. It is a hydrocarbon having the same composition as hesperidene C_{10} H_{16}, and contains a small quantity of an inodorous crystallizable camphor. The commercial oil of neroli is generally yellowish or reddish yellow, and is frequently adulterated with oil of bergamot and orange leaves.

ORA'NIENBAUM, a Russian t. on the gulf of Finland, 19 m. w. of St. Petersburg; pop. '91, 3795. It has a marine hospital and an imperial palace built by prince Menshikoff, and afterwards the favorite residence of Peter III. The palace is surrounded on all sides by orange trees (*oranienbäume*), whence it derives its name.

ORATO'RIO (Ital. *oratorio,* chapel or oratory, the place where these compositions were first performed), a kind of sacred musical composition, either purely dramatic or partaking both of the drama and the epic, in which the text is illustrative of some religious subject, sometimes taken directly from Scripture; and the music consists of recitatives, airs, duets, trios, quartets, choruses, accompanied by an orchestra, sometimes also by an organ, and introduced by an instrumental overture. The oratorio is not intended for scenic representation.

St. Filippo Neri, born in 1515, has been considered the founder of the oratorio. He engaged poets and composers to produce dialogues, on subjects from scriptural and legendary history, in verse, and set to music, which were performed in his chapel or oratory on Sundays and church festivals. The subjects were *Job and his Friends; The Prodigal Son; The Angel Gabriel with the Virgin;* and *The Mystery of the Incarnation.* Stradella composed various oratorios, of which *San Giovanni Battista,* produced in 1670, is praised by Dr. Burney. A number of oratorios, or *azioni sacre,* by Apostolo Zeno and Metastasio, were set to music by Caldara in the beginning of last century. Sebastian Bach's *Passions-Musik* was a species of oratorio, originally performed during the service of the church, the congregation joining in the chorales. Its form arose out of the practice prevalent in the Lutheran church, of having the gospels for the day repeated on Good Friday, and some other festivals, by different persons in a recitative and dialogue style. By far the greatest master of oratorio was Handel, who perfected that species of composition, and was the first to introduce it into England. At the age of 20, when on a visit to Italy, he produced his oratorio of *La Resurrezione* at Rome. *Esther,* the first oratorio written by him in England, was composed for the chapel of his patron, the duke of Chandos, in 1720, the words altered from Racine. It was performed privately at Cannons in the same year, but laid aside, and not produced in public till 1732. An oratorio was then so complete a novelty in England, that it was deemed necessary to give the following explanation in advertising it: "By His Majesty's command, at the King's theater in the Haymarket, on Tuesday the 2d May, will be performed the sacred Story of Esther, an oratorio in English, composed by Mr. Handel, and to be performed by a great number of voices and instruments.—*N.B.* There will be no acting on the stage, but the house will be fitted up in a decent manner for the audience." For many years after the appearance of *Esther,* no more oratorios were produced by Handel, who devoted himself to operas and other secular music; and it was only after the temporary failure of his health, that at the ripe age of 53 he resumed the composition of oratorios. The great oratorios which have made his name immortal were all produced in the decline of life, some of them after he was afflicted with blindness, and they were performed for the most part in the Old Haymarket theater. *Debo-*

rah was first performed in 1733; *Athaliah*, in 1734; *Israel in Egypt*, in 1738; *The Messiah*, in 1741; *Samson*, in 1742; *Judas Maccabæus*, in 1746; *Joshua*, in 1747; *Solomon*, in 1749; and *Jephtha*, in 1751. The two crowning works were *Israel in Egypt* and *The Messiah*—the former ranks highest of all compositions of the oratorio class. *The Messiah*—which, in consequence of its text being taken entirely from Scripture, was called by Handel *The Sacred Oratorio*—ranks very near it in point of musical merit, and has attained an even more universal popularity; from the time when it was first brought out, down to the present day, it has been performed for the benefit of nearly every important charitable institution in Britain. *Judas Maccabæus* is perhaps best known from the flowing and martial grace of that unrivaled military march, "See the Conquering Hero Comes;" and *Saul* is associated in every one's mind with the most solemn of all funeral marches. The orchestra was but imperfectly developed in Handel's time, and his oratorios had therefore originally but meager instrumental accompaniments; they have since been generally performed with additional accompaniments written by Mozart. From Handel's time downwards, it was the practice in London to have oratorios performed twice a week during Lent in the various theaters, which were only given up on the institution of the oratorio performances at Exeter Hall. Haydn composed three oratorios—*The Return of Tobias*, *The Seven Last Words*, and *The Creation*. *The Seven Last Words*, a work full of sweetness and of energy, hardly answers to the common conditions of an oratorio; it is rather a series of symphonies, intended to follow as many short sermons on the sentences uttered by our Lord on the cross, the text being a subsequent addition by the composer's brother, Michael Haydn. *The Creation* originated in a visit of Haydn to London in 1791, when he heard for the first time some of the works of Handel, none of which were then known in Germany. Though less grand than the oratorios of Handel, it is full of fresh lovely songs, bright choruses, picturesque recitatives, and exquisite instrumentation. Beethoven's sole oratorio, *The Mount of Olives*, is a pure drama, rather than the mixed composition generally known under the name. Spohr's *Last Judgment*, produced in 1825, contains some grand music, particularly in the choruses. Costa's *Eli* deserves mention among modern oratorios. But since the time of Handel no other writer of oratorios has approached Mendelssohn. The greatest works of that composer are his oratorios of *St. Paul* and *Elijah;* the former was first produced at Düsseldorf in 1836, the latter at Birmingham in 1846; and at the time of his death he was engaged in a third oratorio, called *Christus*, which he expected would be his greatest, and of which but a few fragments have been published. The oratorios of Mendelssohn have tended greatly to revive the popularity of this kind of composition in Britain. At Exeter Hall in London, and at the musical festivals throughout England, oratorios are performed on a large scale, and with a power, a precision, and a perfection unknown elsewhere. The choruses at the provincial festivals are, for the most part, supplied by Birmingham, Manchester, Leeds, and the other large towns. The greatest oratorio performances are now those of the Triennial Festivals at the Sydenham Crystal Palace. At the festival of 1880, the chorus amounted to over 2,900 voices, and there was an orchestra of 425 performers.

ORATORIUM (Lat. "oratory," called in Greek, *eukterion* or *proseukterion*), as contradistinguished from *ecclesia*, "a church," is the name given to an apartment or building designed for worship of a private or domestic character. From the earliest times, the use of oratorio is traceable in the history of the church; and before the regular organization of parishes, they had probably a considerable place in the common, although not in the public worship. At a later period, oratoria became a common appendage of the castles and residences of the nobility, and were of two kinds; the first, simply for private or family prayer and other devotion; the second, for the celebration of mass. The latter fell properly under the jurisdiction of the bishop or the parochial clergy, and many jealousies and disputes grew out of their establishment or direction. The council of Trent (Sess. xxii., *De Reformatione*) placed them under very stringent regulations, which have been enforced and developed by later popes, especially by Benedict XIV.

ORATORY. See Eloquence; Rhetoric.

ORATORY, CONGREGATION OF THE. The origin of this learned congregation, and its early history, have been detailed under the head of St. Philip Neri (q.v.). It is remarkable, however, that this extraordinary man, unlike most other founders of religious bodies in the Roman Catholic church, had never committed to writing any definite body of rules for the government and direction of the brethren. Even his scattered papers, from which his plans and intentions might have been collected, had been burned by his orders a short time before his death. Soon after that event, the fathers, at the instance of Baronius, compiled from the existing practices and from memory a rule for the congregation, framed so as to embody the spirit of St. Philip. This rule was approved of by Paul V. on Feb. 21, 1612. The fathers of the congregation are a body of priests living in community, but without vows, and under a constitution of a highly democratical character. They are at liberty to withdraw at any time, and to resume possession of the property which they had brought with them at entrance; and even during their association, each member manages his own financial concerns, only contributing a fixed sum to the common expenses of the community. There is no superior-general, as in other orders. Each house is distinct and independent. In each, the

superior is elected only for three years, and his position does not give him any personal pre-eminence whatever. The members take their places according to seniority, not according to official rank, and the superior is compelled to take his turn in all the duties, even down to the semi-menial office of serving in the refectory. The main occupations of the fathers, beyond those of attending to the public service of the church, and the duties of the pulpit and the confessional, lie in the cultivation of theological and other sacred studies, of which "conferences" for the discussion, in common, of theological questions, form a principal feature. The congregation has produced many men of great eminence in sacred science, among whom have been already named the great church historian, cardinal Baronius, and his continuators. To these may be added the celebrated explorers of the Roman catacombs, Bosio, Severani, and Aringhi; and the no less eminent patristical scholar, Gallandi. The houses of the Oratory in Italy before the revolution were numerous, and in high repute. Few towns of any importance were without a house of the Oratory. The congregation was early established in France by the celebrated Pierre (afterwards cardinal) de Berulle, in common with two Italian fathers, and from France it extended to the Low Countries. One important difference, however, is noticeable between the French Oratory and the Roman original. In the former, all the houses of the country are subject to a single superior-general. In France, also, the Oratorians took charge of seminaries and of theological teaching. The French Oratory, as well as the Italian, reckons many illustrious members; but the fame and utility of the French congregation were much marred by the unhappy controversy about Jansenism. In the year 1847 this congregation was introduced into England by Dr. John Henry Newman (q.v.). Soon after his secession from Anglicanism, he established a house, the members of which were for the most part ex-Anglicans like himself, near, and finally at Birmingham; and soon afterwards, a second at London, which has since been transferred to Brompton.

ORBIGNY, ALCIDE DESSALINES D', 1802–57; b. France; educated at La Rochelle. In 1826 he went to South America on a scientific expedition, equipped by the French government. He remained eight years, exploring the country from Brazil to Patagonia, making extensive collections in natural history and botany. He also acquired a large number of historical manuscripts, and vocabularies of the native languages. He was lecturer on paleontology at the museum of natural history, 1836–53. Among his works are: *A Voyage in South America,* 1834–47; and *French Paleontology,* 14 vols., 1840–54.

ORBIS PICTUS (the *Pictured World*), the title of the first picture-book or illustrated manual of instruction for the young, by the celebrated educationist, Comenius, published at Nuremberg in 1657. It was long a great favorite with the youth of Germany, and continued to be reprinted, in various modified forms, down to recent times. Comenius, with the instinct of a great teacher, felt that to give words without things to the pupil was not simply to retard his progress, but to lay the foundation of vague and inaccurate conceptions. Hence his introduction of the pictures of things into the work above named, which, among other things, was intended for those beginning the study of Latin, the connecting of the word with the picture tending to give the pupil a firmer hold or a quicker perception of both word and thing. The great and distinguishing merit of Comenius's book is, that it brought distinctly into notice the necessity of giving children in the earliest stages of their education, not simply a word, but the form of the thing of which the word was the symbol. Further advance on this idea was made by Pestalozzi, who aimed at presenting to the eye of the child the thing itself, whenever it was practicable to do so; and he regarded this as essential to the right education of the human faculties in their infancy. From this, again, flowed the excellent custom of giving object lessons in infant schools. See EDUCATION.

ORBIT, in astronomy, is the path described in space by a heavenly body in its revolution round its primary.* The path so described is of an elliptic form, and would be accurately an ellipse were it not for the disturbing influence of the other heavenly bodies. See PERTURBATIONS. The complete determination of a planet's orbit is of the last importance to astronomers, as it enables them to predict the planet's place in the heavens at any period, and thus determine the exact date of eclipses of the sun and moon, of transits and occultations of the planets, and of the appearances and disappearances of comets. For the determination of a planet's orbit, it is necessary to know three things: 1. The situation of the *plane* of the orbit in space; 2. the position of the orbit in this plane; and 3. the situation at a given epoch, and rate of motion, of the planet in its orbit. Since the plane of the ecliptic is for convenience taken as the reference plane, the position of the plane of a planet's orbit is known when its inclination to the plane of the ecliptic (1), and the line of intersection of the two planes (2), are known. Since the sun, which is the focus of the planetary orbits, lies in this line of intersection, the orbit cannot lie wholly above or below the plane of the ecliptic, but must cut it in two points, called *Nodes* (q.v.), and the position of the line of intersection, or line of nodes, is generally given in terms of the longitude (or angular distance) of the ascending node, reckoning from the equinox. The situation of a planet's orbit in its plane is determined when we know its form (3), size (4), and the position of its major axis or line of

* The sun is the primary of the planets and comets, and each planet is the primary of its satellites (secondary planets).

aspides (5). The size and form of the orbit depend upon the length of its major and minor axes, but astronomers prefer to employ the major axis and eccentricity (see ELLIPSE); and the position of the major axis is known by determining the heliocentric longitude of its *perihelion* (i. e., the extremity of it which is nearest the sun). To complete our knowledge of a planet's motion, all we now require are the epoch of its appearance at some determinate point of its orbit, say at the perihelion (6), and the velocity of its motion in its orbit (7), for when this last is known, the law of areas, as given in Kepler's second law, enables us to determine the position of the planet in its orbit at any future period. These seven facts, the possession of which gives us a complete clue to a planet's motion, are called the seven "elements of a planet's orbit." What has been here stated concerning the planetary orbits, is equally true of the comets and satellites, though, in the case of the latter, the effect of disturbing forces is so great as to produce a considerable change of the elements in one revolution.

ORCA. See GRAMPUS; KILLER.

ORCA'GNA, ANDREA DI CIONE, b. about 1316, at Florence; studied art with his father, Cione, a famous goldsmith, and afterward with Andrea Pisano. In association with his brother Bernardo, he painted a number of works in the Florentine churches, and in the Campo Santo at Pisa, where he executed the *Triumph of Death* and the *Last Judgment*, and his brother the *Hell*. The *Hell* and *Last Judgment* were engraved by Lasinio in his *Pitture del Campo Santo di Pisa*. Orcagna reproduced them in the Santa Croce at Florence; he had already painted in the Strozzi chapel, in Santa Maria Novella, a *Hell* after Dante's *Inferno*, in which some of the portraits are those of personal enemies. His reputation as an architect was high, and he built the Loggia de' Lanzi in the Piazza Granduca at Florence, the church of Or' San Michele, and the famous tabernacle of the Virgin in that monastery; a white marble Gothic altar in pyramidal form, covered with figures and sculptures. The adoption of the semicircular arch in preference to the pointed has been attributed, but wrongly, to Orcagna. The semicircular arch had already been employed by Arnolfo di Lapo and others. Orcagna signed himself sculptor upon his paintings, and painter upon his sculptures. He d. about 1368.

ORCHARD (Goth. *aurtigards*, middle high Ger. *wurzgarte*, Ang.-Sax. *vyrtgeard*, *ortgeard*, a yard or garden for worts or vegetables), a piece of ground specially devoted to the growth of fruit trees, and in which these are planted as near to each other as their profitable cultivation will admit of, no space being left for culinary vegetables, as in the fruit-garden. The introduction of such crops to any considerable extent is injurious to the trees of an orchard, by exhausting the soil, and the vegetables produced are not good. In some orchards the soil is regularly digged, and manure pretty freely supplied, the trees being *dwarf standards*, trained to a low and bushy form, in rows about 12 ft. apart, with rows of gooseberries, currants, or raspberries between them. Such orchards are often very productive, and are not liable to suffer much from winds, whilst the trees also protect each other from frosts in spring. Other orchards are formed in old pastures, the turf being replaced when the trees are planted, or, if they are formed on land that has been under the plow, it is sown down with grass. In these, also, manure is occasionally given. In many cases the grass of orchards is employed for pasturing cattle or sheep, the trees being standards or half-standards, with stems so tall that their branches are beyond the reach of the animals, and in this way the grass produced by the soil is returned to it in the form of manure. In forming orchards of this kind, it is not unusual to plant the *stocks*, upon which the proper grafts or buds are afterward inserted. Great orchards of this kind exist in Devonshire, Herefordshire, and some other southern counties of England, devoted to the growth of apples for the production of cider, and to a smaller extent, of pears for the production of perry. Orchards are not so common in Scotland as in England, where they are not only frequent appendages of the manor-house, but even of the farm-house. Apples, pears, plums, and cherries, not of the finest kinds, are the fruits chiefly produced in British orchards, although some in England also yield walnuts, chestnuts, medlars, mulberries, quinces, etc., and there are even a few small fig-orchards in the most southern parts. Fig and peach orchards are very common in the more southern parts of Europe; and oranges, lemons, etc., on the shores of the Mediterranean.

An orchard requires a dry soil, which ought also to be free and open, not a stubborn clay. A gentle slope, exposing it to the sun, is preferable to perfectly level ground. Protection from prevalent winds, especially in Britain from the s.w. winds, which often blow strongly in autumn, is very necessary; but it is not less important that there should be a free circulation of air, in default of which the trees become covered with lichens and mosses, and cease to be productive. An orchard is often surrounded by a hawthorn-hedge, but a small orchard must not have a very high hedge. Forest trees are often planted as a screen, but must not be too near. Where walnut and chestnut trees will ripen their fruit, they are often planted, on the side most exposed to winds, for shelter.

In laying out the ground for an orchard, it is not unusual to form it into ridges, on the crown of which the trees are planted. But, however this may be, the trees are planted in rows running n. and s., so that the rays of sun may penetrate among them somewhat equally. In planting the trees, their roots are spread out as much as possible, as it is found desirable to encourage them to extend near the surface, rather than to penetrate

deep into the ground, particularly where no digging or cropping is intended. The remarks on soil and manures in the article FRUIT-GARDEN are applicable also to orchards.

ORCHARD-HOUSE, a structure adapted to the cultivation of fruits, of finer kinds than can be produced in the open air, or in greater perfection, without the aid of artificial heat. It is the invention of Mr. Rivers of London, and is a "glass-roofed shed," the front of which is lower than the back, so that the roof slopes towards the sun. The merit of the invention, however, consist not so much in the structure itself, or in the protecting of fruit-trees and admitting of the sun's rays by glass, as in the mode of their treatment, by which a limited space can be made to produce a prodigious quantity of fine fruit. The trees are planted in pots, are never allowed to attain a considerable size, and are so trained and pruned as to have the greatest possible amount of fruitful wood within the smallest possible compass. The pots have a large hole in the bottom, through which the roots may pass; and are placed upon a border carefully prepared for them, of loose and open materials, such as cinders, lime-rubbish and broken bricks, enriched by manure. After the fruit is gathered, the roots are cut through at the bottom of the pot, and the trees are set aside to rest for the winter; and this treatment is repeated from year to year. The orchard-house is generally a very low structure, so that the foliage and fruit are very near the glass; its back being only 7 ft. high.

ORCHESTRA (Gr. *orchēstra*, from *orcheomai*, I dance), in the Greek theaters, the place allotted to the chorus of dancers; in modern theaters, the part of the building assigned to the instrumentalists; and in the modern concert-room, the place occupied by the instrumental and vocal performers. The word orchestra is also used to denote the musicians collectively.

A complete orchestra consists of stringed and wind instruments, and instruments of percussion. The employment of stringed and wind instruments together was long deemed a barbarism. Glück was among the first composers who showed that they could be effectively combined, and his ideas were more fully developed by succeeding composers. The perfecting of the old instruments, and the introduction of new ones, formerly confined to military bands, have added immensely to the power and resources of the modern orchestra, whose capacities, however, have sometimes been misused.

The proper strength of an orchestra must depend on considerations connected with the locality. The stringed instruments should in all cases greatly outnumber the wind instruments; and those latter, the instruments of percussion. The stringed instruments in general use are the violin, viola, violoncello, and double-bass, and their force often amounts to as many as fifty, while even in a large orchestra there are seldom more flutes, hautboys, or bassoons than two of each. The horn trumpet, and ophicleide or serpent, the other wind instruments admitted into the orchestra, are used as sparingly; and of instruments of percussion, a pair of kettle-drums is often considered sufficient, though cymbals and triangles are occasionally added. In a small orchestra, trumpets, trombones, the serpent, and the kettle-drum should be avoided as being too noisy. By far the greatest part of the work falls to the share of the stringed instruments, the parts for which form a complete quartet for first violin, second violin, viola and violoncello, which should be perfect within itself, independently of the parts for the wind instruments. The object of the double-bass is to enforce the violoncello part. This full quartet is occasionally interrupted by harmony in two or three parts, or passages in unisons or octaves. The success of the combination of wind and stringed instruments depends on the skill and judgment of the composer.

ORCHIDS, the popular name for the ORCHIDACEÆ or ORCHIDEÆ, a natural order of endogenous plants ranking third among the orders in the number of genera and species, remarkable also for the wide distribution of its members and for the peculiar structure of their flowers, many of which are of great beauty and exquisite fragrance, others having grotesque or insect-like shapes, and nearly all of which are so formed that they can only be fertilized by the agency of insects. This interesting fact was discovered in the case of certain species by Sprengel in 1793, was more widely applied by Robert Brown in 1833, and later was verified in detail by Darwin, Müller, Gray, and others. The flowers are solitary, racemed, or spiked, and are irregular, consisting of three outer parts (*calyx*) and three inner parts (*corolla*). Sometimes these parts or segments are combined in one piece; often, the petals or inner parts are beautifully colored, spotted, or fringed, and the lower or inferior one, called the lip (*labellum*), is often spurred, or furnished with a cup or sac at its base, or is shaped like a pouch, as in the case of the ladies' slippers or cypripediums. The sacs and spurs contain or secrete honey, and in *Angræcum*, the spurs are of remarkable length. The stamens, one or two in number, together with a sterile rudiment of a third, form with the style or thick, fleshy stigma, the *column*. There is usually only one anther. with a tubercle or abortive anther on each side of it; but sometimes the two lateral anthers are perfect and the central one is abortive; very rarely all three anthers are perfect. The anthers are usually two-celled, the grains of pollen cohering in two or more masses (*pollinia* or *pollen-masses*), and these often are prolonged into a pedicel or stalk with a viscid disk or gland at the end. This disk adheres to the head or proboscis of an insect as it seeks for honey, and the pollinia are carried away to be brought unerringly into contact with the stigma of the next flower visited by the butterfly, moth, or bee, thus securing cross-fertilization. Again, the structure of the petals, generally, is such that the insect

is forced to insert its proboscis or head directly under the pollinia and stigma, thus rendering the removal of the pollinia and the subsequent contact of pollen and stigma inevitable. The ovary is inferior and one-celled, the stigma usually a mere hollow in front of the column. The fruit is usually a capsule, opening with six valves, three of which have placentæ; the seeds are like fine sawdust in appearance, and are so numerous that a single capsule of a maxillaria, it has been estimated, may contain more than 1,700,000. The root is usually composed of simple cylindrical fibres, which are often accompanied with one or more fleshy tubercles or bulbs, a tubercle dying and a new one being produced annually. Often the flowering shoots of orchids are not produced for several years in succession; hence the scarcity of blossoms at one season and their abundance at others. The leaves are parallel-nerved and alternate, but are varied in shape, some being broad, some grass-like, others long and cylindrical; sometimes arising, in tropical species, from fleshy, bulb-like excrescences of the stem; sometimes united at their bases to form a tuber-like body or false bulb, above ground. The leaves of some species, as in our native *aplectrum* or "putty-root," last but a year; those of some tropical species remain for several years. Orchids are endogenous and herbaceous perennials, but some of those found in warm climates are shrubs, and some of these, as vanilla (q.v.) are climbers. The following are the tribes of this botanical family, special articles on which will be found in their alphabetical place: *epidendreæ, vandeæ, neottieæ, ophrydeæ*, and *cypripedieæ*. About 8000 species are known, divided among 334 genera, and fully 3000 species are under cultivation, while the hybrids and varieties are innumerable. In the United States, including Alaska, there are about 75 species, distributed in 20 genera, and of these, seven or eight, belonging to the genus *epidendrum*, and found in Florida and other Gulf states, are epiphytes or air-plants, growing upon branches of trees. Forty-seven species grow in New England.

Orchids are found in all parts of the world except the coldest and the most arid, but are most numerous in the humid forests of the torrid zone, and especially in Mexico, Central, and South America, which furnish such well-known genera as *cattleya, odontoglossum*, and *oncidium*. *Calypso borealis* ranges in British America, as far north as lat. 68°. The tropical species are, as a rule, epiphytal; those of colder climates mostly grow upon the ground, in meadows, rich woods, or cold swamps. Few species are of importance in medicine, and few except salep (q.v.) and vanilla have a commercial value. The prevailing colors of orchids are rose color or lilac, yellow, white, and green. The odor of some species resembles that of violets or orris-root. Of our North American orchids a number are very striking, especially *arethusa bulbosa, pogonia ophioglossoides*, the purple, white, and the yellow fringed-orchises or habenarias, and the showy, the yellow, and the pink ladies' slippers or cypripediums.

The culture of orchids began in England about 1820, but did not become general in the United States before 1865. There are fine collections in the Cambridge, Mass. botanical garden and in the botanic garden at Washington, D. C. High prices are often paid for single plants—in one instance as much as $800, and one collection was sold in England about 1880 for $70,000. Many epiphytal orchids may be planted in pots filled with loose fibrous peat; the roots of others are placed in baskets, or are fastened to blocks of wood or cork, with a little moss around them to retain moisture, and are thus placed on shelves, or are suspended from the roof of the hot-house. Ventilation and temperature must be carefully attended to, and the atmosphere must not be constantly very hot and humid, but seasons of rest must be given to the plants, which in their native climate have generally a wet and a dry season. Most of the American species can be easily grown in shaded gardens. See Lindley, *Folia Orchidacea* (1852); Darwin, *The Fertilization of Orchids by Insects* (1862); Müller, *The Fertilization of Flowers* (trans. 1883); Sander, *Reichenbachia, Orchids Illustrated and Described* (1886–); Baldwin, *The Orchids of New England* (1884); Moore, *Illustrations of Orchidaceous Plants* (1857); Miner, *Orchids, the Royal Family of Plants* (1884); Warner, *Orchidaceous Plants* (1877–78); Burbidge, *Cool Orchids and How to Grow Them* (1874); Sprague, *Orchids* (1876); Williams, *The Orchid-Grower's Manual* (1885).

ORCHOMENOS, a famous and very ancient city of Bœotia, the capital of the once independent kingdom of the Minyæ, and hence called Minyean Orchomenos, to distinguish it from another Orchomenos in Arcadia. It was situated northward from the lake Copaïs, on the left bank of the Cephissus, and extended from the marshy edges of the lake up the face of a steep rocky hill on which stood the acropolis. In the earliest times its dominions extended to the sea. In this city was situated the magnificent "treasury" admired by Pausanias and lately discovered by Schliemann. During the legendary era it became a member of the Bœotian confederacy. During the Persian war, like the other towns of Bœotia, it abandoned the national cause. Its government was thoroughly aristocratic, and after the Peloponnesian war, when Thebes became a democracy, Orchomenos took part with Sparta, and shared in its first triumph over Thebes; but the victory of Epaminondas at Leuctra (371 B.C.) placed Orchomenos at the mercy of the Thebans, who soon after destroyed it by fire, and sold its inhabitants as slaves. It was again rebuilt during the Phocian war, but a second time destroyed in the reign of Philip of Macedon, who, however, once more rebuilt it; but it never again became prominent in history. Orchomenos was famous for its great musical festival in honor of the Graces, when poets and musicians assembled from all quarters to compete for

prizes. The ruins of Orchomenos are still to be seen near the modern village of Skripú. See K. O. Müller's *Orchomenos und die Minyer*, Leake's *Northern Greece*, and Mure's *Tour in Greece*. The Arcadian O. is mentioned in the Homeric catalogue.

ORCIN AND **ORCEIN** are coloring matters obtained from lichens. Orcin, $C_{14}H_8O_4+2H_2O$, may be obtained by boiling certain species of *Roccella* or *Lecanora* with lime for some hours, removing the lime by a current of carbonic acid, evaporating and abstracting with boiling alcohol, from which the orcin separates in red crystals. With chloride of lime, it gives a purple red color, which quickly changes to a deep yellow. Orcin is the true color-producing substance or chromogen of these lichens. In the presence of ammonia, it absorbs oxygen, and is converted into *orcein*, $C_{14}H_7NO_6$, a nitrogenous compound of strong tinctorial power. When isolated, orcein forms a red flocculent powder, which is freely soluble in alcohol, forming a scarlet fluid. Potash and ammonia dissolve it readily, forming a splendid purple color, which is the basis of the ordinary archil of commerce. With metallic salts, its alkaline solutions yield beautiful purple lakes.

ORD, EDWARD OTHO CRESOP, b. Md., 1818; son of James Ord, an officer of the war of 1812; graduated at the U. S. military academy at West Point in 1839. In July, 1839, he was appointed 2d lieut. of the 3d artillery. He served in the Florida war with the Seminole Indians, 1839–42, and was then ordered to the frontier, taking part in many expeditions against the Indians. He was employed on the coast survey, 1845–46. When the war broke out in 1861 he was on duty in California, whither he had twice before been sent; the first time to establish order and a respect for the law, in the performance of which duty he was forced to use very stringent measures, executing several notoriously desperate men; and again in 1855, having been made capt. Sept. 7, 1850. He was appointed brig.gen. of volunteers in Sept., 1861, and the following November was placed in command of a brigade of Pennsylvania reserves, under Gen. McCall, and was raised to the rank of maj. of the 4th artillery in the regular army. He was in action at the battle of Dranesville, near the Potomac, Dec. 20, where he defeated the confederate cavalry under Gen. Stuart. For this service he was brevetted maj.gen. of volunteers in May, 1862, and a month later was transferred to the west, where he participated in the engagements that made memorable the months of August and September, events in which the army of the Mississippi figured. He was placed in command of Corinth under Gen. Grant, and subsequently of the 2d division of the district of w. Tennessee. For gallantry at Iuka, Sept. 19–20, he was brevetted col. At Hatchie, Oct. 5, he was in command, and was dangerously wounded; for his services he was brevetted brig.gen. During the siege of Vicksburg and capture of Jackson, he commanded the 13th army corps, and afterwards the 8th corps in the middle department, July 9–21, 1864, and the 18th corps in operations before Richmond, July 21 to Sept. 30, 1864. He was again severely wounded in the assault and capture of Fort Harrison, near Richmond, Sept. 29, 1864, and brevetted maj.gen. On Jan. 9, 1865, he superseded Gen. Butler in command of the department of Virginia and North Carolina, and of the army of the James, which he commanded from Jan. to June, 1865, through the siege of Petersburg, and subsequent movements against the army of northern Virginia, under Gen. Lee, to the surrender at Appomattox Court House, April 9, 1865. His rank at the close of the war was lieut.col. of the 1st artillery, dating from Dec. 11, 1865, in the regular army, and maj.gen. of volunteers, which latter he continued to hold, and was at the head of various departments until Sept., 1866, when, having been promoted to brig.gen. in the regular army the July previous, he was mustered out of the volunteer service. He was commander of the 4th military district of Mississippi and Arkansas, from April to Dec., 1867, and was afterwards in command of the departments of California, the Platte, and Texas. He retired from the service Dec. 8, 1880. He d. 1883.

ORDEAL (Anglo-Saxon, *ordaal;* from *or*, primitive, and *daal*, judgment; Ger. *urtheil*, judgment), a practice which has prevailed largely among various widely separated nations, of referring disputed questions, particularly such as relate to the guilt or innocence of an individual, to the judgment of God, determined either by lot, or by the success of certain experiments. Of its existence among the ancient Jews, we have an instance in Numbers v., where a Hebrew woman, accused of adultery, is required to drink the waters of jealousy as a test of innocence; a similar ordeal for incontinence is in use among the natives of the Gold Coast of Africa. Compurgation of accused persons by fire, as existing among the Greeks, is referred to in Sophocles's *Antigone*. Among the Hindus, the ordeal has been in use to be practiced in nine different ways—by the *balance*, by *fire*, by *water*, by *poison*, by the *cosha*, or drinking water, in which images of the sun and other deities had been washed, by *chewing-rice*, by *hot oil*, by *red-hot iron*, and by drawing two images out of a jar into which they have been thrown. (*Asiatic Researches*, vol. i., p. 389).

The ordeal seems to be prevalent throughout Africa. "When a man," says Dr. Livingstone, "suspects that any of his wives have bewitched him, he sends for the witch-doctor, and all the wives go forth into the field, and remain fasting till that person has made an infusion of the plant (called 'goho'). They all drink it, each one holding up her hand to heaven in attestation of her innocency. Those who vomit it are considered innocent, while those whom it purges are pronounced guilty, and put to death by

burning. The innocent return to their homes, and slaughter a cock as a thank-offering to their guardian spirits. The practice of ordeal is common among all the negro nations n. of the Zambesi." The women themselves eagerly desire the test on the slightest provocation; each is conscious of her own innocence, and has the fullest faith in the *muavi* (the ordeal) clearing all but the guilty. There are varieties of procedure among the different tribes. The Barotse pour the medicine down the throat of a cock or dog, and judge of the innocence or guilt of the person accused by the vomiting or purging of the animal.

Throughout Europe in the dark ages the ordeal existed under the sanction of law, and of the clergy. The most prevalent kinds of ordeal were those of *fire, water,* and the *wager of battle. Fire ordeal* was only allowed to persons of high rank. The accused had to carry a piece of red-hot iron for some distance in his hand, or to walk nine feet barefoot and blindfolded over red-hot plowshares. The hand or foot was bound up and inspected three days afterwards: if the accused had escaped unhurt, he was pronounced innocent; if otherwise, guilty. Under such a judicial system, there were probably few acquittals; but it is believed that in the severer kinds of ordeal, precautions were sometimes taken by the clergy to protect those whom they wished to clear from suspicion. Queen Emma, mother of Edward the Confessor, when suspected of a criminal intrigue with Alwyn, bishop of Winchester, is said to have triumphantly vindicated her character by walking unhurt over red-hot plowshares. *Water ordeal* was the usual mode of trial allowed to bondsmen and rustics, and was of two kinds—the ordeal of *boiling water,* and of *cold water.* The ordeal of *boiling water,* according to the laws of Athelstane, consisted in taking a stone out of boiling water, where the hand had to be inserted as deep as the wrist; what was called the triple ordeal, deepened the water to the elbow. The person allowed the ordeal of *cold water* (the usual mode of trial for witchcraft) was flung into a river or pond; if he floated without any appearance of swimming, he was judged guilty—while if he sank, he was acquitted.

The *wager of battle* was a natural accompaniment of a state of society which allowed men to take the law into their own hands. The challenger faced the west, the challenged person the east; the defeated party, if he craved his life, was allowed to live as a "recreant;" that is, on retracting the perjury which he had sworn to. See BATTEL, TRIAL BY; and Neilson, *Trial by Combat* (1890).

Other kinds of ordeal were practiced in particular circumstances in different parts of Europe. In the ordeal of the *bier,* a supposed murderer was required to touch the body of the murdered person, and pronounced guilty if the blood flowed from his wounds. The ordeal of the *eucharist* was in use among the clergy: the accused party took the sacrament in attestation of innocence, it being believed that, if guilty, he would be immediately visited with divine punishment for the sacrilege. A somewhat similar ordeal was that of the *corsned,* or consecrated bread and cheese: if the accused swallowed it freely, he was pronounced innocent; if it stuck in his throat, he was presumed to be guilty. Godwin earl of Kent, in the reign of Edward the confessor, when accused of the murder of the king's brother, is said to have appealed to the ordeal of the corsned, and been choked by it. An early form of ordeal, abolished by Louis le debonnaire in 816, was that of the *cross:* the accuser and accused stood upright before a cross, and he who first fell, or shifted his position, was pronounced guilty. It was done away with, as being irreverent towards the mystery of the cross. Besides these, there was the ordeal by *lot,* dependent on the throw of a pair of dice, one marked with a cross, the other plain.

Trial by ordeal at first carried with it the sanction of the priests, as well as of the civil power, though the clergy in the course of time came to discountenance it. In England it seems to have been continued till the middle of the thirteenth century. On the continent it was, generally speaking, abolished rather earlier, although as late as 1498 we find the truth of Savonarola's doctrine put to the test, by a challenge between one of his disciples and a Franciscan friar, to walk through a burning pile. In Scotland, in 1180, we find David I. enacting, in one of the assemblies of the frank tenantry of the kingdom, which were the germ of parliaments, that no one was to hold an ordinary court of justice, or a court of ordeal, whether of battle, iron, or water, except in presence of the sheriff or one of his sergeants; though if that official failed to attend after being duly summoned, the court might be held in his absence. The first step toward the abolition of this form of trial in Saxon and Celtic countries, seems to have been the substitution of compurgation by witnesses for compurgation by ordeal. The near relatives of an accused party were expected to come forward to swear to his innocence. The number of compurgators varied, according to the importance of the case; and judgment went against the party whose kin refused to come forward, or who failed to obtain the necessary number of compurgators. To repel an accusation, it was often held necessary to have double the number of compurgators who supported it, till at length the most numerous body of compurgators carried the day.

ORDER. In classic architecture, the order or ordonnance comprises the column with its base and capital and the entablature. There are five orders: (1) Tuscan, (2) Doric, (3) Ionic, (4) Corinthian, (5) Composite. The first and fifth are Roman orders, and are simply modifications of the others. The remaining three are the Greek orders. See COLUMN, GREEK ARCHITECTURE, ROMAN ARCHITECTURE.

ORDER, in natural history, a group constituted for the purpose of classification, inferior to *class* and *sub-class*, but superior to *family, tribe, genus,* etc. The term NATURAL ORDER is used in botany to designate an order belonging to the natural system of classification, in contradistinction to one of an artificial system devised for mere convenience of the student, and signifies that the limits of the order agree with the truth of nature, and that it thus exhibits affinities really existing. In all branches of natural history, classification now proceeds on this principle. The use of the term is not precisely the same in zoölogy as in botany. Zoölogy, from its greater scope and complexity, requires a more varied extension and application of all divisions or groupings; of kingdoms, sub-kingdoms, classes, sub-classes, orders, etc., but by common consent, orders in botany are frequently termed families, whilst what answers to *family* in zoölogy is called *tribe* in botany. Thus, it is common to speak of the order Ranunculaceæ as the *crowfoot family.* It is divided in five tribes, viz: clematideæ, anemoneæ, ranunculeæ, helleborineæ, and cemicifugeæ. These tribes are then divided into genera, as *clematis, anemone, ranunculus,* etc., and these genera, again, into species. In some cases a tribe in botany has much the same position as a sub-family in zoölogy, but its order has all the marked distinctions of an ordinal grouping, and never descends to the position of a family, although it may be so denominated. The use of the term order in zoölogy is illustrated in the article INVERTEBRATE ANIMALS.

ORDER. This word is applied to an aggregate of conventual communities comprehended under one rule, or to the societies, half military half religious, out of which the institution of knighthood sprang. Religious orders are generally classified as monastic, military, and mendicant.

The earliest comprehension of monastic societies under one rule was effected by St Basil, archbishop of Cæsarea, who united the hermits and cenobites in his diocese, and prescribed for them a uniform constitution, recommending at the same time a vow of celibacy. The Basilian rule subsists to the present day in the eastern church. Next in order of time was the Benedictine order, founded by St. Benedict of Nursia, who considered a mild discipline preferable to excessive austerity. The offshoots from the Benedictine order include some of the most important orders in ecclesiastical history, among others the Carthusians, Cistercians, and Præmonstrants. The order of Augustinians professed to draw their rule from the writings of St. Augustine; they were the first order who were not entirely composed of laymen, but of ordained priests, or persons destined to the clerical profession.

The military orders, of which the members united the military with the religious profession, arose from the necessity under which the monks lay of defending the possessions which they had accumulated, and the supposed duty of recovering Palestine from the Saracens, and retaining possession of it. The most famous orders of this kind were the Hospitallers or Knights of St John of Jerusalem, the Knights Templars, and the Teutonic order. Many other military orders existed, and not a few continue to exist, particularly in Spain and Portugal. The phraseology of the old military orders is preserved in the orders of knighthood of modern times, into which individuals are admitted in reward for merit of different kinds, military and civil.

The three mendicant orders of Franciscans, Dominicans, and Carmelites were instituted in the 13th century. Their principal purpose was to put down the opposition to the church, which had begun to show itself, and also to reform the church by example and precept. At a later period the order of the Jesuits was founded, with the object of increasing the power of the church, and putting down heresy.—Notices of the more important orders, monastic, military, and mendicant, will be found under separate articles. See also KNIGHTS, MONACHISM, PRIEST.

ORDERICUS, VITALIS, a mediæval historian, born at Atcham, near Shrewsbury, in 1075, was taken to France at the age of five, and educated for the monastic life in the abbey of Ouche, at Lisieux. He became a priest in 1107, and died, it is thought, about 1143. Ordericus is the author of a so-called church history (*Historiæ Ecclesiasticæ*), in 13 vols. It is a chronicle of events from the birth of Christ down to his own time. Books 3–6 give an account of the Norman wars in England, France, and Apulia down to the death of William the Conqueror. The last half of the book is the most valuable, being a record of the history of the author's own times. The first edition of the *Historiæ Ecclesiasticæ* was published by Duchesne, in his *Hist. Norm. Scrip.* (1619). It has also been printed by the French historical society (2 vols. 1840), and was translated into French by Dubois (4 vols. 1825–27).

ORDERLIES are soldiers or sergeants appointed to wait upon general and other commanding officers, to communicate their orders, and to carry messages. The *orderly officer,* or officer of the day, is the officer of a corps or regiment, whose turn it is to superintend its interior economy, as cleanliness, the goodness of the food, etc. *Orderly non-commissioned officers* are the sergeants in each company who are "orderly," or on duty for the week. On the drum beating for orders, they proceed to the orderly room, take down the general or regimental orders affecting their respective companies, show them to the company officers, and warn the necessary men for any duties specified in those

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ORDERS.—1. Polish order. 2–4. Spanish orders. 5. Papal order. 6. American
15. Star of the Legion of Honor. 16. Order of the Garter. 17. Golden flee
Andrew. 21. Order of Alexander-Newsky. 22. Swedish order of the Seraj
of the Red Eagle. 27. Iron Cross. 28. Turkish order. 29. Persian order.

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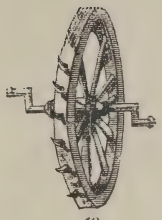
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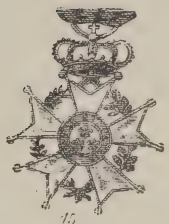
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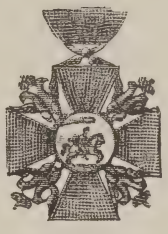
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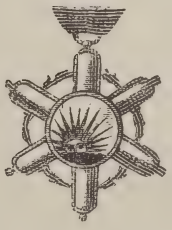
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ler of the Cincinnati. 7–13. Orders of the Middle Ages. 14. French order of the Holy Spirit.
. 18. Bavarian order of St. Michael. 19. Portuguese order of Christ. 20. Russian order of St.
m. 23. Saxon order. 24. Guelphic order (Hanover). 25. Order of the Black Eagle. 26. Order

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orders. An *orderly book* is provided by the captain of each troop or company in a regiment for the insertion of general or regimental orders from time to time issued.

ORDERS, ARMY, are general, divisional, brigade, or regimental. General orders are issued by the commander-in-chief of an army, and affect the whole of his force. The others emanate from generals of division or brigade, or from officers commanding regiments, and severally affect their respective commands.

ORDERS, HOLY, an institution regarded in the Greek and Roman churches as a sacrament, by which ministers are specially set apart for the service of religion, and are regarded as receiving a certain religious consecration, or, at least, designation for their office. While some of the reformed churches altogether deny the distinction of ranks in the ministry, none of them admits more than three ranks, of bishop, priest, and deacon. But in the Roman and Greek churches a further classification exists. In the Roman church, a distinction is made between the major (or holy) orders and the minor orders. Of the major orders, three have been described in general terms, under the head hierarchy (q.v.), viz., the classes of bishops, priests, and deacons. A fourth rank of subdeacons is generally regarded as one of the major orders, but its functions closely resemble in their nature and their degree those of the deacon. The minor orders in the Roman church are four in number—those of door-keeper, reader, exorcist, and acolyte. To none of these orders is any vow of celibacy annexed. Some of their functions had their origin in the peculiar religious condition of the early church. The duties of door-keeper arose chiefly out of the discipline in regard to the penitents and catechumens; but although these functions find no room in the modern discipline of the Roman church, the door-keeper of the modern church is held to succeed to other functions of his ancient prototype in relation to the catechetical instruction of children and of the poor and ignorant. Preparatory to the receiving of these orders, candidates are initiated in what is called the *tonsure,* which consists in the cutting off of the hair, as a symbol of separation from the world and its vanities—a rite which appears also as one of the ceremonies of the religious profession. Tonsure, however, is not reckoned as an order; it is but a distinguishing characteristic of a class. In the Roman church the sacrament of orders is held to produce an indelible character, and therefore to be incapable of being forfeited and of being validly repeated. This, however, applies only to the holy orders. The Greek church has the distinction of major and minor orders, in common with the Roman. But the Greeks commonly exclude sub-deaconship from the major orders, and all the functions of the four minor orders of the Roman church are united by the Greeks in one single order, that of reader (*anagnōstes*).

In the Anglican and other Protestant Episcopal churches the three higher orders of bishop, priest, and deacon are alone retained. An Anglican clergyman may be deprived of his benefice, or suspended by his bishop, for various ecclesiastical offenses; and the right of the court of arches to pronounce sentence of deprivation has also been recognized. But in the usual case of deprivation, the clergyman does not forfeit his status of priest or deacon, which can only be lost by deposition or *degradation.* Statue 23 Hen. VIII. c. 1. s. 6 reserves to the ordinary the power of degrading clerks convicted of treason, petit treason, murder, and certain other felonies, before judgment. A bishop may be deprived of his see by his metropolitan, with or without the co-operation of a synod of the bishops of the province, but it has been questioned whether he can be lawfully deprived of his orders as bishop. A clergyman of the church of England and Ireland cannot become a member of the house of commons. In the Presbyterian and other non-episcopal churches, the ceremony of ordination is not held to impart any indelible character. A minister found guilty of heresy or immorality is deprived of his office by *deposition,* by which his clerical status is forfeited. His removal from his charge, however, in any other way, does not affect his office as a minister; and a minister removed from one charge to another, or, after a time, inducted into a new charge, is not re-ordained. A minister having no charge or flock may yet dispense the sacraments if duly called upon. A minister deposed ceases altogether to be a minister, and is no more capable of any of the functions of the office than if he had never been ordained.

The ceremony of *imposition of hands* is used in almost all Protestant churches in the ordination of ministers, the ordaining bishop or presbyters placing the right hand on the head of the person ordained; and is always accompanied with prayer. It is deemed a proper and Scriptural form (1 Tim. iv. 14), but not essential.

In the church of Scotland and other Presbyterian churches, when an already ordained minister is inducted into a new charge, no imposition of hands takes place. In the Scottish and American Presbyterian churches, candidates for the ministry are *licensed to preach the gospel* before being *called* to any particular charge, and are then styled *licentiates* or *probationers.* They are licensed, according to an old phrase, "for trials of their gifts," but are not entitled to dispense the sacraments.

There is nothing to prevent a minister of the church of Scotland, or any Presbyterian or Independent church, from being a member of the British house of commons.

ORDERS IN COUNCIL, orders by the sovereign with the advice of the privy council. The privy council of Great Britain has no power to legislate, except so far as authorized to do so by parliament; but in periods of emergency it has nevertheless occasionally issued and enforced orders of a legislative kind; those who were concerned in passing,

promulgating, or enforcing the orders trusting to parliamentary protection, and taking on themselves the personal responsibility of the proceeding. In such cases an act of indemnity afterwards passed has relieved from liability those who advised the order or acted under it, and given compensation to all who suffered by its enforcement. This course was adopted in 1766 with regard to an embargo on the exportation of corn, issued in consequence of a deficient harvest and prospect of famine. An important constitutional question was raised by the famous orders in council issued by Great Britain in 1807 and 1809, in reprisal for Napoleon's Berlin and Milan decrees. The Berlin decree, issued on Nov. 21, 1806, declared the whole of the British islands to be in a state of blockade, and all vessels trading to them to be liable to capture by French ships. It also shut out all British vessels and produce both from France and from all the other countries which gave obedience to the French. A subsequent decree, issued soon afterwards, obliged all neutral vessels to carry letters or certificates of origin—that is, attestations by the French consuls of the ports from which they had sailed, that no part of the cargo was British. In retaliation for the Berlin decree, the British government issued, on Jan. 7, 1807, an order in council, subjecting to seizure all neutral vessels trading from one hostile port in Europe to another with property belonging to an enemy. This order was at first extensively evaded, while the French made vigorous efforts to enforce the Berlin decree; the result was that new orders were issued by the British government on the 11th and 21st of Nov., 1807, declaring France and all states subject to the French to be in a state of blockade, and all vessels liable to seizure which were found to have certificates of origin on board, or which should attempt to trade with any of the ports of the world thus blockaded. Neutral vessels intended for France, or any other hostile country, were ordered, in all cases, to touch first at some British port, and to pay custom-house dues there, after which they were in certain cases to be allowed to depart for their destination; and vessels clearing from a hostile country were similarly to touch at a British port before proceeding on their voyage. On Dec. 27, 1807, Napoleon's Milan decree was issued, which declared the whole British dominions to be in a state of blockade, and all countries were prohibited from trading with each other in any articles of British produce or manufacture. The Americans, and those of the public of Great Britain who were interested in the export trade, exclaimed loudly against the edicts of both powers, and the legality as well as the expediency of the orders in council were called in question in parliament. The result was that an inquiry was instituted into the effect of the orders, from which no direct result followed. But, in the mean-time, on April 26, 1808, a new order in council was issued, limiting the blockade to France, Holland, a part of Germany, and the north of Italy, and the order which condemned vessels which had certificates of origin on board was rescinded. Subsequent orders introduced a system of furnishing licenses to vessels to proceed to hostile ports after having first touched and paid custom-house dues at a British port; no fewer than 16,000 of these licenses are said to have been granted. The legality of these orders has been called in question on the ground that they were more of a legislative than an executive character, in so far as a fictitious blockade, where there is no blockading force present, is contrary to the law of nations; it has been defended on the ground that they were issued in execution of the royal prerogative of declaring and conducting war. They are generally believed to have added to the general distress, and the check on the progress of manufactures produced by Napoleon's decrees; but, on the other hand, it has been maintained that they were essential to the effective prosecution of the war.

There are various matters connected with trade and the revenue as to which orders in council have been authorized by statute; parliament, in fact, delegating its legislative authority to the queen in council. For example, the international copyright act, 7 and 8 Vict. c. 12, contains a provision for empowering the crown, by order in council, to extend the privileges of British copyright to works first published in any state which gives a like privilege to the productions of this country.

ORDINAL, the service used in Episcopal churches for the ordination of ministers. The English ordinal was drawn up by a commission appointed in the third year of Edward VI. (1550), and added to the *Book of Common Prayer*. It was slightly modified in the reign of Elizabeth, and was again revised by the convocation of 1661. The English ordinal, in its general structure, resembles the ancient services used for that purpose, but possesses much greater simplicity, and has some features—e.g., the numerous questions addressed to the candidates—peculiar to itself. There are separate services for the "making of deacons" and the "ordering of priests," but these are practically joined in one, and used on the same day The service for the consecration of bishops is altogether distinct.

The ordination takes place at one of the ember seasons, and during the public service, after morning prayer and a sermon on the subject, and begins with the presentation of the candidates by the archdeacon. The bishop inquires as to their fitness, and commends them to the prayers of the congregation. The litany is then said with special petitions for the candidates for each order, and the communion service commences with a special collect, epistle, and gospel. Between the epistle and gospel the oath of supremacy is administered, and the candidates for deacons' orders are questioned by the bishop and ordained. The gospel is read by one of the newly ordained deacons. The candi

dates for priests' orders are then solomnly exhorted and interrogated, and the prayers of all present are asked for the divine blessing upon them. For this purpose a pause is made in the service for silent prayer. After this the hymn, *Veni Creator Spiritus* (Come, Holy Ghost, our souls inspire)—a composition of great antiquity, supposed to be as old as the 4th c.—is sung, and, the candidates kneeling before the bishop, he and the assistant presbyters lay their hands upon the head of each, with the words, "receive the Holy Ghost for the office and work of a priest in the church of God," etc.

The only other ceremony is the presentation of each candidate with the Bible in token of authority to preach; as the deacons had been before presented with the New Testament with authority to read the gospel. The service concludes with the administration of the sacrament of the Lord's-supper.

The consecration of bishops is performed by an archbishop, or some bishop appointed in his place, and two or more of his suffragans, and may take place on any Sunday or holy day. The service is very similar to that for the ordination of priests.

ORDINANCE OF 1787, an act of congress under the confederation in respect to the government of the territory of the United States n.w. of the Ohio river. The large states which, by their original charters from the English crown, included within their boundaries portions of the n.w. territory, were not willing at first to relinquish jurisdiction over their several parts, but smaller states like Maryland and New Jersey claimed that the territory ought to be surrendered as common property, inasmuch as it was the united effort of all the states that had secured independence. Accordingly, after considerable agitation, New York fixed a limit for its western boundary, and ceded a part of its lands for the states that became members of the confederation. Virginia soon followed, giving up the state's lands n.w. of the Ohio; and a law was passed for the temporary government of the territory, which provided for the organization of a state whenever its inhabitants numbered 20,000. No settlements of any consequence, however, were made during the following three or four years. The ordinance of 1787, three years later, has usually been attributed to Nathan Dane, a representative from Massachusetts in the congress of the confederation, although it has been claimed that a clergyman, the Rev. Manasseh Cutler, originated it. The ordinance defined the rights of the citizens, prohibited slavery within the territory, and provided that the navigable waters leading into the Mississippi and St. Lawrence rivers, and the carrying-places between the same, should be common highways. It was passed at a very critical time in the formation of the union; and subsequent events have shown that it was of the greatest importance, as there was danger of the whole region becoming a slave territory.

ORDINATION, the rite or ceremony by which ministers of the Christian church are dedicated to their sacred office. The use of a ceremonial for such purposes is traceable among the Jews (Exod. xxix. 24, Levit. xxi. 10, Num. iii. 3); and the New Testament contains frequent reference to the specific ceremonial of "imposition of hands" (Acts vi. 1–7, xiii. 1–4, xiv. 23; 1 Tim. iv. 14, v. 22; 2 Tim. i. 6). In the Roman, the Greek, and the other eastern churches this rite of ordination is held to be sacramental, and it is reserved, at least as regards the major orders (see ORDERS, HOLY), exclusively to bishops. In extraordinary cases it was permitted to cardinals and to certain abbots to confer the minor orders. Considerable controversy exists among Catholic writers as to what are essential portions (*materia sacramenti*) of the rite of ordination. Some place it in the "imposition of hands," some in the "presentation of the instruments" symbolical of each order. The controversy derives some importance from the diversity which exists between the Greek and Roman ceremonial; but on this head Roman Catholics maintain that the essential rites are contained alike in both ceremonials. As regards the *validity* of the rite of ordination, the mere fact of its being conferred by a bishop suffices; but there is not any part of the Roman discipline which is more jealously guarded by laws than the administration of orders. The candidate can only be *lawfully* ordained by "his own bishop" (*proprius episcopus*), or with the authority of his own bishop, which must be communicated to the ordaining bishop by what are called dimissorial letters. The candidate may be claimed by a bishop as by "his own bishop" under any of four titles —of birth, of domicile, of benefice, or of connection by personal service; and if an ordination be attempted without some one of these titles, heavy ecclesiastical penalties are incurred as well by the ordainer as by the ordained. On the part of the candidate himself, certain qualifications are required; and certain disqualifications created or propounded by the canon law, called *irregularities*, are held to render an ordination in some cases invalid, and in all unlawful.

In the church of England and other reformed Episcopal churches, the rules of the ancient canon-law are retained, by which no one could be ordained without previous examination of his fitness, or who was disqualified by bodily infirmity, illegitimacy, immorality, or simony, or who was unprovided with a title (i.e., an appointment to serve in some church), which should provide him with a maintenance; or who, being a candidate for deacon's orders, was under 20, and for priest's under 24 years of age; but the age for admission to deacon's orders is changed to 23. A college fellowship is admitted as a title. (For the ceremony of ordination see ORDINAL.) A person can only be ordained by the bishop in whose diocese he is to serve, except on *letters dimissory* from that bishop to another.

In other reformed churches ordination is performed by the presbytery, or by one or more ordinary ministers. Some small Protestant denominations have no ceremony of ordination whatever.

It may be added that the Roman Catholic church, the Church of England, and the Protestant Episcopal church of the United States do not consider ordination valid unless the officiating bishops are in the line of succession from the apostles. The former rejects ordination by the Greek and other eastern churches not as invalid, but as unlawful, because the officiating bishops are not in ecclesiastical connection with the pope. In common with the eastern churches, it places ordination among the seven sacraments, and teaches that it conveys to the candidate supernatural grace and fitness for his office, and imparts to him a permanent character which forever distinguishes him from the laity. Presbyterian churches believe that, in accordance with apostolic precedent, the power to ordain is vested in the ministers of a presbytery, all of whom are, in scriptural usage, identical with bishops. In Congregational churches (including the Baptist) the power of ordination rests with the local church, which is always expected in the interest of fellowship to call a council of churches to which they intrust the exercise of the power on behalf of the church; thus a congregation exercises the right of judgment concerning the qualifications of a candidate, and gives him a call to be its minister; after which it invites other churches in council to examine his credentials, character, and theological views. If the council be satisfied with him they ordain him with prayer and laying on of hands. In Wesleyan Methodist churches ordination is performed in the annual conference, with a bishop or president at its head, and without the laying on of hands. Among Calvinistic Methodists the sanction and assistance of their ministers alone is required. The society of Friends select their ministers according to their usual quiet methods of arriving at general consent, and dispense with all ceremonial in setting them apart to the work.

ORDNANCE, as used here, will apply in its general signification to arms other than those fired from the shoulder, such as are usually known as cannon, great guns, shell guns, etc. Rapid-fire and machine guns will be found under separate headings, as also will be magazine rifles and breech-loading arms. Military weapons in use before the invention of gunpowder can hardly be included, and the general idea will be to simply refer to smooth-bore types and describe more at length the modern high-powered weapon of the day. The exact date at which cannon were first used is not definitely known; but "crakys of war" were used by Edward III. against the Scots in 1327, by the French at the siege of Puy-Guillaume in 1338, and by Richard III. at Crécy and at Calais in 1346. The first cannon were clumsy, wider at the mouth than at the chamber, and made of iron bars hooped together with iron rings, a principle that is being copied somewhat in what is known as the wire-wound gun of to-day. The balls fired from them were at first made of stone, afterwards superseded by iron. In the 15th century various bombards, culverins, serpentines, etc., were all known as cannon. Bombards of great length and power were employed by Louis XI. during his Flemish campaign in 1477, some with stone balls, some with iron. About this time cannon began to be made by casting instead of with hooped bars, and bronze or brass as a material began to be used as well as iron. The size was also reduced and the finish improved. The largest cannon made in the 17th century, so far as is known, was the Bejapoor cast-iron gun "Malick é Meidan," or "Lord of the Plain," made either by Aurungzebe, or by the Mahrattas; it was 14 ft. long, 28 in. bore, and required a ball of 1600 lbs. weight.

From the time of the great European wars in that century cannon have undergone vast improvements, as well as the science and art of artillery necessary for their management. Prior to the general introduction of rifled cannon, which may be said to date from the close of the Crimean war, although early in the 17th century cannon with rifled grooves were known to exist, the various sizes of iron-shell guns ranged from 8-inch to 12-inch calibre; long iron guns from 9 pounders to 32 pounders; brass guns from 1 pounder to 12 pounders; iron howitzers, 8 and 10 inch; brass howitzers, 12, 24, and 32 pounders; iron carronades, 12 pounders to 68 pounders; iron mortars, 8, 10, and 13 inches; brass mortars, 4.4 to 5.5 inches. The Crimean war set inventors vigorously at work, and many admirable rifle guns have been the result. Several plans were introduced and, with modifications, have been the leading types among the various nations. The first rifled artillery introduced into the English service were guns of Armstrong design, fitted with the designers' original system of breech closure, which consisted of a vent piece locked in position by a breech-screw with a continuous thread. After a brief trial these guns were superseded by others of muzzle-loading type. The cause of the failure of the former, however, must be attributed to the imperfections of the system rather than to the fact of their being breech-loaders. The return to muzzle-loaders is quite generally recognized as being a step in the wrong direction, as, after a lapse of fifteen years, England found herself compelled to take up the question of a breech-loading system anew. In June, 1879, the report of a committee on ordnance urged a full consideration of the relative advantages and disadvantages of muzzle-loading and breech-loading, and the government at once started in upon a course of experimental construction of some of the heaviest calibres then in existence. Pending this decisive action by the committee, two breech-loading guns of 6 and 8-inch calibre, made by Armstrong, were tried, and the former proved so satisfactory that a number were ordered and used in the navy. As a result of the committee's experiments, guns varying in calibre from 4 to 12

inches were made. The guns had a heavy steel tube reinforced over the rear portion with wrought-iron coils and jacket, the trunnion piece being welded to the jacket. They also had the interrupted-screw breech-closure and the Elswick cup obturation. In 1881 guns were made of heavy steel tubes supported by steel coils. Shortly after this, as the result of the testimony of a number of experts, it was decided that the breech-screw should engage in the jacket and not in the tube; that the hoops should be made as long as possible and be carried well forward on the tube; that steel was better than wrought iron; that it should be treated by annealing and oil tempering, and that the De Bange obturation is superior to all other systems adapted to the interrupted-screw breech-closure. Guns of 16.25 inches calibre and weighing 111 tons are the largest that have been made, the charge of which weighs 1000 pounds and the projectile 1800 pounds.

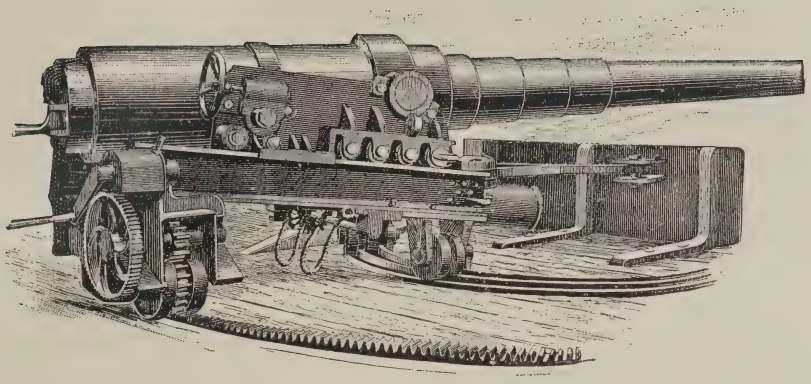
That the proper limit has been exceeded in these monster guns is now the general opinion, and a study of them while working under trial at sea has shown that they are subject to the following disadvantages, particularly for use on board ship: Excessive weight, necessitating for their handling the use of complicated machinery, which is liable to get out of order when subjected to rough shocks and sudden strains incident to use at sea; great length; increased weight in armor necessary to give adequate protection to the gun and its machinery; slow rate of fire and unwieldiness of the loading and pointing arrangements. A Maitland wire-wound gun of 9.2-inch calibre was made upon the following principles: The tube is made much thicker over the chamber than elsewhere, and the thick part is turned down in steps toward the centre. Over the hollow thus formed, and which extends nearly half the length of the gun, is coiled wire ribbon one-fourth by one-eighth inch in section, of a tensile strength of 80,000 pounds to the square inch; the ends of the wire, after heating in a blow-pipe, are bent to the proper direction and secured by screws and plugs. The trunnion-ring and jacket are shrunk on over the wire and are locked together. The total weight is 22 tons and the maximum charge 270 pounds. A 6-inch wire-wound steel jacketed gun, constructed on the Longridge system, fired a 100-pound projectile with a 54-pound charge, the initial velocity being 2149 feet per second and the pressure 19.6 tons per square inch. In the "Quick's system" the only marked feature is the breech mechanism. In this the forward portion of the breech plug is considerably larger in diameter than the powder-chamber, and also than the rear portion of the plug, and on opposite sides one-quarter of the thread is removed, so as to form two parallel plane surfaces. The screw-box is fitted with a female screw to receive the threaded portion of the plug. Extending from the screw-box, at right angles to the bore and parallel to the axis of the trunnions, is a recess of rectangular section having plain bearing surfaces on all sides. By means of the lever handles the plug can be rotated until one threaded portion is disengaged, and can then be moved bodily to the left through the recess until the bore is unmasked for loading; this is all done by one continuous motion of the handles, and the same movement automatically opens the primer chamber and extracts the spent primer tube. The plug is guided throughout by a pin on the lever traveling in the groove in the face of the breech. The breech-plug of heavy calibres is operated by means of a pinion on the lever gearing in a rack screwed to the face of the breech, and the mechanism is made susceptible of the application of hydraulics.

Up to 1875, or perhaps a little later, the heavy artillery of France was composed of cast-iron guns hooped with steel, some without liners, others with steel liners extending about half way up the bore, and others still with liners extending the entire length of the bore, all indicating a persistent effort to perpetuate the use of cast iron in some part of the construction. On the other hand, the French had perfected as early as 1866 the interrupted-screw breech-closure, and had adopted an excellent system of obturation; the axial vent and safety firing arrangement were added in 1874. The all-steel construction was introduced in the face of decided protests from some of the leading French artillerists of the day, but it was introduced, nevertheless, and about 1875 designs were prepared for all-steel guns of from 27 to 42 centimetres calibre, the last named being the heaviest gun in the French service to-day. Since then no other material has been employed in the construction of any naval gun, although the manufacture of cast-iron coast-defense ordnance was continued until 1881. The salient features of the original model are the heavy body, composed of two parts of about equal weight united by a hook scarph; the tube, which extends from the obturator seat to the muzzle, some two or three calibres beyond the body; and the hoops, in two or three layers, according to the calibre, which reinforce the body to a short distance in front of the trunnions. The body is of steel, forged but not tempered; the tube is also of forged steel, but tempered in oil; the hoops of puddled steel. A longitudinal section of the interior displays an enlarged obturator seat, a long cylindrical powder chamber of diameter but little greater than the calibre; a short conic frustrum connecting powder and shot chambers, and a slightly coned shot chamber sloping into the bore. A committee appointed to inquire into the causes that led to mishaps to several of these guns reported that the design was defective, and recommended screwing a sleeve on to the tube and locking it to the body of the gun in which the breech-plug is lodged. These recommendations were adopted. Upon the introduction of slow-burning powders many of the guns of the 1875 model were re-chambered to take a heavier charge of the new powder. In 1881–82 designs were prepared for guns of all service calibres up to 34 centimetres, in which the length of bore, save in a few guns intended for special purposes, was increased to 28 calibres, from about 19 cali-

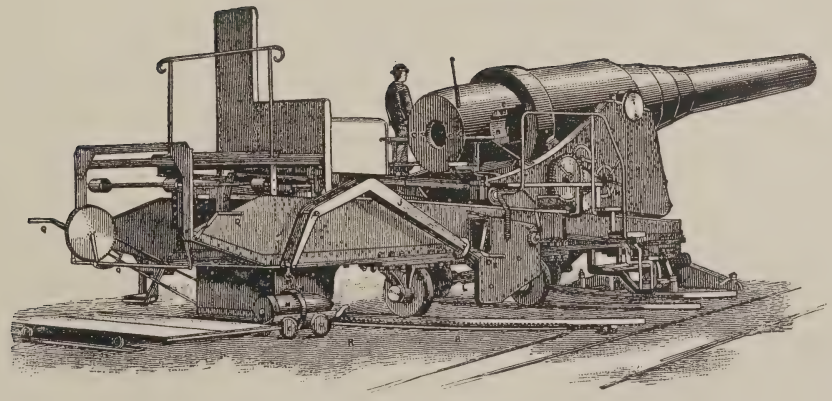
bres in the model just described. These guns constitute the 1881 model, and are the most approved pattern actually in service; they are hooped but not tubed, and the material used throughout is steel, forged and oil-tempered. In the interior are preserved the same characteristics as those described above; but the chamber is of much greater diameter than formerly, and the final twist of the rifling is increased from 4° to 7°. It will perhaps be noticed that, while all parts unite to resist the transverse stresses, the longitudinal stress is borne by the tube alone. Certain difficulties having been encountered in the manufacture of guns of large calibre of the model of 1881, notably in obtaining an equable temper in the large masses of steel called for by the design, a new design was proposed that it was thought would obviate these difficulties. The guns are tubed; a sleeve similar to that found in the later guns of the 1875 model screws on to the rear end of the tube and accommodates the breech-plug; the tube is hooped to within about eight calibres of the muzzle; a jacket about sixteen calibres long is shrunk over the first layer, and is in turn reinforced with a second layer of five hoops, one of which carries the trunnions. The appearance in actual service of the high power and rapid-fire guns of the *Canet* type, and the results obtained from them on proof trials are among the most interesting items of recent progress in ordnance. The guns derive their name from M. Canet, the director of ordnance of the Société des Forges et Chantiers de la Mediterranée, who is the originator of the system upon which they are constructed. The guns are built up at this company's extensive works at Havre of all French steel, that employed in the construction of tubes, hoops, and jackets being comparatively soft, quite elastic and unusually tensile, and that for the breech mechanism relatively hard. The system is intended to include guns of from 3.6-inch calibre up to 16.8-inch, every one of which is to have six subdivisions, each to be denominated by its length expressed in calibres. The following are the main characteristics of the guns: An inner tube extending the entire length of the gun, which, as compared with tubes of other types, is of great thickness. A jacket and a sleeve are shrunk upon the rear end of the tube and connected at the joint by a trunnion-ring, which butts against a shoulder of the jacket and is screwed on to the sleeve. These extend well beyond the trunnions, and, with a layer of broad steel hoops extending to the muzzle, give great longitudinal resistance, and enable the tube to withstand the greater pressure due to the use of smokeless powders. Over the jacket and sleeve are then shrunk one or more layers of steel hoops, which vary in number and thickness according to the size of the gun. All parts vary gradually and uniformly in thickness, and all bearing surfaces are cylindrical. It is claimed that this method of assembling gives as great a resistance longitudinally as transversely. Three 32-centimetre (12.6-inch) guns of this type were made for the Japanese government, constructed to fire smokeless powder, to give the same results as would be obtained from a charge of 616 pounds of brown prismatic powder. The following table shows a comparison between nearly similar American, German, French, Russian, and English guns, and what results are anticipated from them in practice:

Type of Gun.	Calibre, inches.	Weight, tons.	Length, calibres.	Powder charge, pounds.	Projectile, pounds.	Muzzle velocity, ft. secs.
American	12	46	35	425	850	2,000
English	12	45	25.2	295	714	1,892
French	12.6	65.8	38	630	990	2,025
Russian	12	50.5	30	247	732	1,942
German	12.01	48.4	35	357.2	1,003	1,853

The following breech mechanism is applied to all the larger calibres. On one side of the rear face of the breech-plug is a toothed sector gearing into a toothed rack. This rack is part of a bearing which encloses a nut cast in one with a pinion. This nut works on a screw supported by bearings screwed into the face of the breech of the gun. The teeth of the pinion are helicoidal, and so cut as to gear into the screw threads of the breech-plug. To open the breech a lever is pulled to the rear, thus transmitting a rotary motion through an endless screw and worm-wheel to the screw above referred to. The pinion is held by lateral guides which embrace two of the teeth, so that neither can revolve, in consequence of which the nut and pinion-piece rise, causing the rack to be forced up and around the toothed sector, and thus to revolve the breech-plug. When the plug is completely withdrawn a bolt locks it to the carrier-plate. The obturator used is a modification of the De Bange. A fixed axial stem is screwed into the rear face of the breech-plug, carrying a nozzle-piece on its front face, upon which is an obturating cup, to prevent the escape of gas. The obturator is in two parts: a mushroom, screwed on to a hollow spindle that slides upon the axial stem. The firing slide is in one piece, working in a slot on the rear face of the breech-plug. It has a lug which rests against the outer edge of the face-plate, the latter being so shaped that the lock cannot pass into the firing position except when the breech is entirely closed. The hammer is provided with a roller against which bears a lug at the end of a rod against which pressure is exerted by a spring. On the breech-plug is fitted a horizontal axis carrying a two-armed lever, which acts as the primer extractor. The lock-string is made fast to a trigger, which is engaged in a tumbler. Upon pulling the string the firing-pin and spring are



MODERN STEEL 6-INCH RIFLE (U. S. NAVY).



KRUPP 15¾-INCH STEEL RIFLE, MOUNTED ON SEA-COAST CARRIAGE

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released and the hammer is driven on the nipple. On the trigger are mounted four fingers which serve as safety firing appliances.

Up to the present time two 8-inch, 14-ton breech-loading rifles have been assembled at the Kiangnan Arsenal near Shanghai, China. The steel used in construction was imported from England rough turned, and was afterwards smooth-turned and assembled at the above-named works. Material is also on hand for the construction of guns of still larger calibres. The history of the development of ordnance material in Germany is the history of the development of the Krupp establishment, and a short description of the Krupp system will be necessary for a thorough understanding of the modern ordnance that has given such satisfactory results both afloat and ashore. The material used in the construction of the Krupp guns is steel. The system is that of a built-up gun, with tube and hoops. In the larger guns of latest design the first hoop shrunk on the rear of the tube is lengthened. The fermeture is the cylinder-prismatic wedge, modified from the original invention of Broadwell, and adopted by Krupp. The gas-check is also an invention of Broadwell, and bears his name. The essential point is that the main supply of the artillery of Germany is drawn from one private firm. In this respect the method differs from that followed either in England or France.

It was in the summer of 1879 that Krupp startled artillerists with the most magnificent series of experiments ever witnessed, the chief event being the trial of a new 71-ton gun, 21.8 calibres long. With a charge of 485 pounds of prismatic black powder and a 1715-pound projectile, a velocity of 1702 foot-seconds was recorded, the crusher gauge indicating a pressure of 20.9 tons. The accuracy of the gun was remarkable; six shots were placed within a vertical rectangle measuring less than 18 inches in height by 71 inches in width at a range of 2734 yards. In 1881 Krupp advanced at a step from guns of 25 to guns of 30 and 35 calibres total length, the heavier calibres being hooped to the muzzle. The shot chamber, which in the old pattern was cylindrical and connected with the bore by means of a short frustrum of a cone, was now made conical, and sloped gradually into the bore; the rifling has an increasing twist of from 50 to 25 calibres instead of the former uniform twist of about 45 calibres. The heaviest guns in existence are the four Krupp 40 cm. made for the Italian government. The acceptance trials took place in 1886. The terms of the contract required that one gun of the four should fire at least fifty rounds with projectiles of 2028 pounds weight, to which should be given a muzzle velocity of 1804 foot-seconds. Ten of the fifty rounds were to be fired at a target distant 2734 yards, and it was stipulated that all of the shot should fall within a vertical 10.7 feet square. All the requirements were satisfactorily fulfilled, and the guns were accepted.

The government of Russia has been an extensive purchaser of Krupp cannon; but after adopting the Krupp gun for its armament, it proceeded to manufacture on that system for its own use. The course pursued to produce a supply from home manufacture was that of joint action between the government and the steel works at Aboukhoff. The heavy ordnance for naval and seacoast defense is designed to give velocities from 1800 to 2000 feet. There are guns from 6-inch to 12-inch already made for use afloat and in sea-coast batteries. For land fortresses the 6-inch gun is the prevailing type. A large number of siege-guns on hand are of bronze, but a new steel pattern is gradually replacing them. All field guns are of steel, and are mounted on a carriage fitted with rubber buffers, to reduce the shock. The special novelty of the Russian ordnance is a thin steel lining tube designed to receive the wear in firing, and to be renewed when needful without the expense of retubing. This system is adopted for all calibres, from the smallest up to the 12-inch gun inclusive. The rear end of the lining tube forms the recess for the Broadwell ring. During the last war with Turkey these tubes were renewed on the field. Being too heavy, in the case of the large calibres, for the available means of transportation, they were forwarded in three pieces. These were screwed together, and the whole forced into place by means of a jack, where they did excellent service. They have introduced the Whitworth system of liquid compression in making their gun steel, the effect of which has been very beneficial, as their guns compare very favorably with those made by other Continental powers.

Previous to the year 1881 but little was done by the United States government to improve the ordnance beyond converting some of the old smooth-bore Dahlgrens and Rodmans into rifles. With the former, mere makeshifts as they were, our ships were sent abroad, there to find splendid steel rifles, both breech-loading and muzzle-loading. When, however, it was decided, 1881, to appropriate money for modern cruisers, it was also determined to arm them with high-powered rifles. In compliance with this law the Naval Bureau of Ordnance began the construction of 5, 6, and 8-inch steel breech-loading rifles. The metal used in the two lighter calibres was of domestic manufacture, but at the time the contract was awarded no domestic firm could furnish forgings of sufficient size for an 8-inch gun, and the contract was therefore given to English firms. Since that time, however, the industry of making steel forgings has made rapid strides, and this country is no longer obliged to send abroad. The 5 and 6-inch guns are made on the same system of construction, which is practically as follows: The tube extends the whole length of the bore. A jacket fits over the breech end of the tube and holds the breech-plug. The transverse strain is borne by the tube, jacket, and hoops combined, the last two being given an initial tension by being shrunk on. The amount of shrinkage is based

on the actual characteristics of the metal, and is calculated so that for a certain internal pressure each of the three parts shall work at its elastic limit. The longitudinal strain is taken up by the jacket, aided by the locking and trunnion-hoops, and by the friction between the jacket and the tube and hoops caused by the shrinkage. This last is, of course, very considerable, but the jacket is made more than strong enough to bear any longitudinal strain that could possibly be put upon it. The bore, formerly 30 calibres long, has been increased to 35 calibres, and the guns hooped to the muzzle. The various dimensions of the breech-plug are calculated by empirical formulæ based on experience with this system of fermeture—the De Bange—both here and abroad. The elevating band is shrunk on and adds but little, and is not intended to contribute any to the strength of the gun. The rifling twist of the earlier guns starts with one turn in 180 calibres, increasing uniformly for some distance until it reaches one turn in 30 calibres, which is the twist for the remaining distance to the muzzle. The reverse edge of the grooves is given a twist slightly less than that of the driving edge, in order to slightly decrease the width of the grooves from the breech to the muzzle end of the bore. This is done to allow for the wearing of the band, ensuring a good hold on it throughout the bore, and preventing the gases from getting by the band and causing erosion. The 6-inch gun is designed to fire a projectile weighing 100 pounds with a charge of 50 pounds of powder. The standard type of 8-inch gun is now, like the 6-inch, hooped to the muzzle, thereby greatly strengthening it against strains in the chase. The powder chamber has been reduced, thereby enabling a reduction of the exterior diameters of the body of the gun, and consequently permitting the additional hoops, without adding to the gun's weight The grooves as now made remove less of the metal than in former types, and it is thought will result in less erosion from powder gas. The rifling twist increases from zero at the origin to one turn in twenty-five calibres at the muzzle, the curve being the semi-cubical parabola. The breech mechanism has been improved in several important respects, and the gun is now thought to be rather the superior to the best types of its class and kind abroad. The 8-inch, like the smaller guns, is fitted with the De Bange obturator, slightly modified. The means of working the breech block is also more elaborate, as to readily move so heavy a block as 314 pounds some mechanical means had to be employed. For this reason a crank has been fitted to the arm of the plug. On the spindle of the crank is a pinion working into a ratchet on the exterior of the jacket. In regard to the strength of the 8-inch there is a margin of 4.5 tons per square inch before reaching a point that would even strain the gun, while the limit of safety would be far in excess of that amount. Longitudinally the gun will stand (inside the elastic limit) a pressure of 38.4 tons per square inch. The strains to which the modern type of guns is subjected, transverse and longitudinal, are so distributed that an undue amount shall not fall on any one part. For this reason the tube is relieved as much as possible from longitudinal strain by placing the screw-plug in the jacket. Longitudinal strain sustained by the breech-plug is transferred by the threads of the screw to the jacket, which is partly held by the grip of shrinkage and partly by its shoulder on its front end taking against the abutting hoop, which in turn transfers it to the trunnions through the screw-threads on the trunnion band. The trials with an 8-inch gun, using 110 pounds of powder and a 250 pounds projectile, resulted in a muzzle velocity of 2129 feet per second, a muzzle penetration in steel of 15.8 inches, a muzzle energy of 7855 foot-tons, and 600 tons energy for each ton of gun. These, in some respects, are the best that has been attained by any other nation using a similar type of gun. Two lines of sights have been provided, one on the left side for long ranges and one over the central line for close quarters. The side sights consist of a finger point on the left side of the trunnion band and a bar working in a box on the rear face of the last hoop. This bar is raised and lowered by means of a worm, so that it requires no clamp-screw, and remains at the height given it. To compensate for the drift due to rifling the screw-bar is set at a permanent angle of 0° 45′ to the left of the vertical, and besides this incline it is set bodily to the left 0.17 of an inch. This arrangement gives a very accurate line of sight. The head of the bar is provided with an open sight notch, so that the target may be seen above and below the line of sight. There is also a sliding leaf, which is graduated in degrees of horizontal angle simply for convenience, and is used for making corrections for the wind, speed of ship, or speed of the enemy. The shell for these guns are given a rotary motion by a soft copper band which is forced into an undercut score on the shell, the bottom of the score being corrugated to prevent the copper from turning. The band projects beyond the sides of the shell, and is forced into the rifling grooves by the compression slope, thus cutting off any escape of gas. The 10, 12, and 13-inch guns have no trunnions, but have projecting rings which fit in corresponding hollows in the bed of the slide, and are held in place by bands. Thus far the navy has four 4-inch, two 5-inch, seventy-seven 6-inch, fifteen 8-inch, and four 10-inch guns completed. Work upon 12-inch guns is about to begin. It is now thought that 13-inch guns, 35 calibres in length will be the largest guns needed for naval purposes. The 6-inch gun, 35 calibres long, gave 2100 foot-seconds velocity, with but 15 tons powder pressure in the chamber. Work is in progress on 4-inch and 5-inch rapid-fire guns 40 calibres long. During the year 1890 the following type guns have been completed at the Watervliet Arsenal, and are the beginning of the new coast defense armament: One 8-inch rifle, steel; one 10-inch rifle, steel; one 10-inch rifle, cast-iron, wire-wrapped; one 3.6-inch field gun,

steel ; one 3.6 steel mortar. The completion of a type 12-inch steel rifle, a 10-inch steel wire gun, and a 12-inch steel mortar is expected within a few months. The following shows the maximum results of the tests of these guns :

	8-in. Rifle.	10-in. Rifle.	3.6 in. Field Gun.	3.6 in. Mortar.
Powder—lbs	140	255	4 lbs. 603	1
Projectile "	300	571	20	20
Muzzle velocity, f. s	1,957	1,953	1,560	677
Pressure per sq. in., lbs	40,000	37,285	35,780	18,500
Muzzle energy, ft. tons	7,973	15,113	.....	.....

ORDNANCE FABRICATION. The main features of gun construction as carried on at the Washington navy yard are the same for all calibres, and are also practically the same as those in use at the Watervliet Arsenal. The material for hoops, jackets, and tubes is purchased from private parties, the machining, assembling, and finishing being done at the government foundries. The forgings are not finally accepted until the gun is finished, so that should any flaw be discovered during the machining the loss falls upon the founder or contractor.

Government inspectors are at the various steel works to see that the specifications relating to the characteristics of the metal are carried out. In addition test pieces are forwarded to Washington and Watervliet for special testing. The turning of the various parts is conducted with the greatest care and accuracy. For measuring interior diameters light steel bars having hemispherical ends are fitted by the use of a micrometer scale to the exact interior diameter of the piece. For measuring exterior diameters fixed calipers are used, which are adjusted by the use of the small steel bars and a micrometer scale to the exact interior diameters required. The interior of the jacket being finished as accurately as possible, it is then measured by a star gauge at intervals of 1 inch to ½ inch for its entire length. To each of these diameters is added the amount of shrinkage for the jacket, and each inch of the length of the tube under the jacket turned to fit exactly the corresponding increased interior diameters. The amount of shrinkage is determined by the qualities and diameters of the two pieces which come in contact, and may differ considerably in different guns or different parts of the same gun. The tube and jacket being ready to be put together, the former is placed in the shrinking pit, muzzle down, on heavy blocks. The tube stands in such a position that the forward end of the jacket, when in place, will come a little above the floor of the foundry. At the level of the floor is built a water-tight dam surrounding the tube and about 2 feet deep. The jacket is expanded by heating, and when sufficiently enlarged is swung over by cranes and lowered in its place over the tube. When nearly in its seat the chain of the crane is suddenly let go and the jacket falls a few inches, thus setting it hard upon the shoulders. In this position a cross-bar is placed over the breech, and by means of it and a bar through the bore, set up with nut and screw, the jacket is held firmly in place, while at the same time water is put in the dam around its forward end, ice being added to keep the temperature down. In some cases gas jets are used to give the necessary expansion, and hydraulic presses used to keep the pieces firmly abutting. The gun being assembled, which means when all of the hoops are in place, it is returned to the lathe and its exterior finished down to the required diameters. The bore is then smooth-bored to the diameter of the bands, and the chamber reamed out and coned. The gun is now ready for rifling, and is placed on a planing machine and rests in collars, so that it can be given a motion of rotation as each cut is made. The rifling has one turn in twenty-five calibres at the muzzle, starting from zero and increasing, the curve being a semi-cubical parabola, the number of grooves being in each case four times the number of inches of the calibre ; for example, the 8-inch guns have thirty-two bands and thirty-two grooves. Longitudinal strain sustained by the breech-plug is transferred by the threads of the screw to the jacket, which is partly held by the grip of shrinkage and partly by the shoulder on its front end taking against the hoop next it, which in turn transfers it to the trunnions through the screw threads on the trunnion band. The tube is made to resist forward motion by the shoulder in rear of the hoop just forward of the end of the jacket, which also has a shoulder locking into a similar projection on the hoop that surrounds its rear half. This last has a similar interlocking with the hoop outside of it, which bears against the shoulder of the trunnion band in the same manner, so that by screwing up on the trunnion band the systems of hoops are so drawn up against each other that longitudinal motion of the tube is effectually prevented. The jacket hoops and the chase hoops add only to the transverse strength.

In addition to making these " built-up" guns, cast-steel guns have been tried. One gun made of Bessemer steel and a second of open-hearth steel were tried, both 6-inch guns. The rough-bored and turned castings were furnished by the contractors and machine finished at the Washington navy yard. The Bessemer steel gun was first tried, and, though fired with a charge and projectile of the same kind and weight as those used in the naval high-power 6-inch rifle, the gun burst. The open-hearth gun fared somewhat better, but although it did not burst, it was found to be so enlarged in the

powder chamber and in the portion of the gun near the compression slope that it was condemned as unfit for use. See Maurice, *War* (1891); and the articles ARTILLERY; BREECH-LOADING ARMS; RAPID-FIRE GUNS; MACHINE GUNS; FORTIFICATION; and NAVIES, MODERN.

ÖREBRO. See OEREBRO.

OR'EGON, one of the Pacific coast states, and the 20th in order of admission to the Union; in lat. 42° to 46° 18′ n., long. 116° 33′ to 124° 25′ w. It is bounded on the n. by Washington, from which it is chiefly separated by the Columbia river; e. by Idaho, the Snake or Lewis river forming part of the boundary; s. by Nevada and California, and w. by the Pacific ocean; being 360 m. from e. to w. by 290 from n. to s., with a gross area of 96,030 sq. m., or 61,459,200 acres; land surface, 94,560 sq. m.

HISTORY.—The name O., of uncertain origin and meaning, was introduced by Jonathan Carver, who in his *Travels,* published in 1778, applied it to the Columbia. Bryant, in his *Thanatopsis,* made a similar use of it; from 1817 on, in the correspondence and publications of Hall J. Kelley, the enthusiastic promoter of immigration to O., it was extended to the territory drained by the river, and finally came to include the vast tract w. of the Rocky mountains, between latitudes 42° and 50° 40′ n., with a total area of 300,000 sq. m. In 1578, Drake, the English navigator, discovered the coast in lat. 48° n.; in 1592, De Fuca, a pilot in the Spanish service, mapped the coast as far as lat. 55° n. Admiral Pedro Fonté and others followed in 1640. In 1778, Cook, when attempting to find a n. w. passage, visited Fuca strait, and his companion, Vancouver, in 1792, by order of the British admiralty, surveyed the coast between 30° and 60° n. lat. The latter ascended the Columbia as far as the site of the present town called after him, but owed his knowledge of the river to Capt. Robert Gray, of Boston, who a short time before (May) had discovered it, ascended it a short distance, and named it after his vessel, the Columbia. Gray's circumstantial report to the government gave the U. S. a valid claim to the valley of the river. In 1762, the territory w. of the Mississippi was ceded by France to Spain; but as England still claimed the sovereignty of the n. w. coast, Spain granted her, by treaty in 1790, the right to navigate, trade, and settle on any shore not previously occupied by Europeans. This treaty was abrogated in 1796 and renewed in 1814. In 1800, the territory was recovered by France, and in 1803, with the Louisiana purchase, passed to the U. S. The surveys of Lewis and Clarke, on the Columbia and its tributaries, 1804–6, gave the U. S. the best title to the region. In 1810, Capt. Winship, from New England, built the first house in O., near Oak point. In 1811, the American Pacific fur company established Astoria at the mouth of the Columbia. This, during the war of 1812, was dishonorably sold to the British Northwest fur company (subsequently merged into the Hudson Bay company), and became fort George, regaining its old name in 1818, but remaining in the company's possession till 1845, as did, till 1860, the depot at fort Vancouver. In 1818, a treaty of joint occupancy was signed by Great Britain and the U. S. and renewed in 1827. In 1824–5, Russia, which had settlements within the limits of the present O. and California, made a 10 years' agreement with the U. S. and Great Britain to make no new claims s. of 54° 40′ provided they made none n. of it; navigation and trade, however, were permitted, with certain restrictions, and the strip now forming the s. part of Alaska was leased to the Hudson Bay company. Not long after the expiration of the agreement, Russia was induced by the U. S. to withdraw from the coast s. of 54° 40′. In 1832, some Flathead Indians went from O. to St. Louis begging for religious teachers for their people, a request answered by the Methodist board of missions and the A. B. C. F. M. Under the direction of the first-named board, a party headed by Reverends Jason and Daniel Lee settled in the Willamette valley in 1834, and established the O. manual labor training-school. In 1835, Dr. Marcus Whitman and Rev. Samuel Parker, commissioned by the A. B. C. F. M., explored and reported favorably, and in 1836, Dr. Whitman and wife, Rev. H. H. Spalding and wife, and Mr. W. H. Gray established a small missionary colony in the Walla Walla valley. Immigration, however, was slow, owing to the prevalent idea that the territory was valueless and difficult of access, and by the efforts of the Hudson's bay company to encourage that belief. Petitions for a territorial government were presented to congress in 1839 and 1840. In 1842, Dr. Whitman discovered a plot to check immigration from the U. S. and to make O. a permanent British possession; and convinced of its value to the U. S., he made a perilous horseback journey to Washington in the winter of 1842–3, only to discover that during his trip the Ashburton treaty had been signed. This, as it defined the n. boundary of the U. S. as ending at the Rocky mountains, on the 49th parallel, excluded O. On his return, in 1843, Whitman led back the first independent emigrant train, of 200 wagons, and was soon after followed by Frémont, at the head of an exploring expedition. Meantime, Feb., 1841, the settlers had taken steps to form a civil government, completing the organization in July, 1843, and forming, May 14, 1844, a provisional government, with laws based on the statutes of New York and Iowa. The seat of government was fixed at Willamette Falls (now O. City). The first general election was held June 3, 1845. These decisive measures, added to the arguments that had been presented by Whitman to Webster, President Tyler, and others, convinced the country that the claim to O. was worth enforcing, and in 1846 the U. S. terminated the treaty of 1818.

AREA AND POPULATION OF WASHINGTON AND OREGON BY COUNTIES.

(ELEVENTH CENSUS: 1890.)

WASHINGTON.

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Adams	1,908	2,098	Mason	996	2,826
Asotin	640	1,580	Okanogan	7,258	1,467
Chehalis	2,104	9,249	Pacific	896	4,358
Clallam	1,824	2,771	Pierce	1,376	50,940
Clarke	648	11,709	San Juan	600	2,072
Columbia	864	6,709	Skagit	1,916	8,747
Cowlitz	1,124	5,917	Skamania	1,636	774
Douglas	4,552	3,161	Snohomish	1,720	8,514
Franklin	1,244	696	Spokane	1,680	37,487
Garfield	672	3,897	Stevens	6,194	4,341
Island	220	1,787	Thurston	768	9,675
Jefferson	1,688	8,368	Wahkiakum	244	2,526
King	1,944	63,989	Walla Walla	1,296	12,224
Kitsap	392	4,624	Whatcom	2,468	18,591
Kittitas	3,344	8,777	Whitman	2,124	19,109
Klickitat	2,176	5,167	Yakima	5,760	4,429
Lewis	2,308	11,499			
Lincoln	2,296	9,312	Total	66,880	349,390

OREGON.

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Baker	1,970	6,764	Linn	2,700	16,265
Benton	1,370	8,650	Malheur	9,936	2,601
Clackamas	1,684	15,233	Marion	830	22,934
Clatsop	815	10,016	Morrow	2,020	4,205
Columbia	693	5,191	Multnomah	440	74,884
Coos	1,750	8,874	Polk	615	7,858
Crook	8,150	3,244	Sherman	510	1,792
Curry	1,590	1 709	Tillamook	1,525	2,932
Douglas	4,875	11,864	Umatilla	2,885	13,381
Gilliam	1,700	3,600	Union	3,035	12,044
Grant	5,472	5,080	Wallowa	2,890	3,661
Harney	10,600	2,559	Wasco	3,315	9,183
Jackson	2,880	11,455	Washington	645	11,972
Josephine	1,605	4,878	Yam Hill	640	10,692
Klamath	5,520	2,444			
Lake	8,040	2.604	Total	94,560	313,767
Lane	3,860	15,198			

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BRITISH COLUMBIA
VANCOUVER ISLAND
Strait of Juan de Fuca
Gulf of Georgia
Cape Flattery
Cape Johnson
Destruction I.
Cape Disappointment
Columbia R.
Point Adams
Tillamook Head
Cape Mears
Toke Point
Leadbetter Pt.
Oysterville
Peterson's Point
Sea Side
Astoria
Ilwaco
Long Beach
Port San Juan
Port Townsend
Port Angeles
Dungeness
Crescent Bay
Neah Bay
Pysht
Clallam Bay
Sekiu
Quillayute
Lapush
Mt. Olympus
Mt. Baker
Mt. Rainier
Mt. St. Helens
Mt. Adams
Whatcom
Fairhaven
Bellingham
Blaine
Sumas
Skagit
Mt. Vernon
Snohomish
Everett
Seattle
Tacoma
Olympia
Mason
Jefferson
Clallam
Pacific
Wahkiakum
Cowlitz
Lewis
Thurston
Pierce
King
Kittitas
Yakima
Klickitas
Skamania
Clarke
Columbia
Vancouver
Portland
Washington
Oregon
Lake Chelan
Lake Wenatchee
Lake Roosevelt
Lake Kaniksu
Lake Pend d'Oreille
Okanogan
Conconully
Ruby
Omak
Silver
Salt L.
Twisp R.
Methow R.
Okanogan R.
Columbia R.
Kettle Falls
Marcus
Fort Colville
Colville
Old Mission
Chewelah
Valley
Calispel
Calispel L.
Deer Park
Loon Lake
Thetis
Hunters
Frutland
Walker's Prairie
Spokane Ind. Res.
Spokane
Hazard
Crescent
Rathdrum
Mica
Rockford
Spangle
Waverly
Latah
Rock Creek
Sprague
Harrington
Sassin
Crab Creek
Davenport
Wilbur
Creston
Lincoln
Hesseline
Waterville
Douglas
Badger
Alkali L.
Grand Coulee
Great Plains of the Columbia
Ephrata
Wenatchee
Entiat R.
Chelan R.
Methow R.
Twisp R.
Okanogan R.
Foster Cr.
Grand Coulee
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Providence
Endicott
Colfax
Palouse
Garfield
Whitman
Adams
Franklin
Grant
Benton
Kittitas
Yakima
Klickitas
Skamania
Clarke
Columbia
Vancouver
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Many in congress insisted that the boundary line should be carried to lat. 54° 40′, but 49° was finally settled upon; Great Britain consented to extend the boundary to Fuca strait, and the treaty was ratified July 17; though it was not till 1872 that San Juan and other islands in the strait were awarded to the U. S. In Nov., 1847, the massacre of Dr. and Mrs. Whitman, with 12 others, began an Indian war that lasted several months. In 1848, Aug. 14, congress passed the act to organize the territory, which then included Washington t. and Idaho. In 1849, March 3, the government was inaugurated on the arrival of Joseph Lane, the first governor, and U. S. courts were established. The discovery of gold in California and the establishment of the overland route placed the Willamette valley within reach of explorers, and stimulated immigration. In 1850, congress passed the "donation law," giving 320 acres of public lands on the Pacific slope to any actual settler and 320 acres more to the wife, on all lands entered previous to December of that year; and from Dec. 1, 1850, to Dec. 1, 1853, the right in like manner to enter 160 acres each. In 1855, Salem became the capital. In 1857, a state constitution was formed and ratified, and in 1859, Feb. 14, O. was admitted as a state, with its present boundaries. The only checks to its prosperity in recent years have been the Indian wars of 1855, 1872 (Modoc war), and 1877–8.

Geography.—Two ranges of mountains and one broad upheaval, with many spurs ramifying from it, divide the state into four widely different parts. The Coast range, 10–30 m. from the sea, an irregular line of rounded, thickly wooded elevations, has an average height of 2,500 ft., a maximum of 4,000 ft., and is drained by deeply fissured streams running through rugged but fertile valleys to the sea and into the Willamette valley eastward. Parallel with the coast, and 110–150 m. from it, stretches the great Cascade range, a continuation of the Sierra Nevada range of California, having a mean elevation of from 6,000–7,000 ft., but crossed by some moderately low passes, and containing the loftiest mountains in the state. These mountains, volcanic in origin, rising from the low level of the Willamette and Columbia river valleys, and lifting their peaks above the limit of perpetual snow, are seen in all their majesty. Mount Hood, 30 m. from the Columbia and 150 m. from the Pacific, is 11,225 ft. high, and, according to Indian tradition, was active at a comparatively recent period; Mount Jefferson, 50 m. further s., is 10,200 ft.; the Three Sisters, about 9500 ft.; Diamond peak, 8807 ft.; Mount Scott, 40 m. s., 7,123 ft.; Mount McLoughlin or Pitt, 8 m. w. of Klamath lake, 9760 ft. Living glaciers are numerous in the Cascade range; those on Mt. Hood exceeding any found in the Alps. Western O., again, is divided into three great valleys. The beautiful Willamette (which, with the narrow strip along the coast, is the richest by nature and most populous part of the state), 150 m. long by 30–70 miles wide, contains 5,000,000 acres; the Umpqua, bounded on the north by the Callapooia range, 2,500,000 acres; the Rogue, walled off from the rest of the state, 2,400,000 acres. Western O., with the exception of the Willamette and Rogue river valleys, is densely timbered. Middle O. has no valleys of great size, and is in its s. part a volcanic plateau. The Blue mountains, running transversely toward the n. e., and forming a vast plateau, constitute the third great mountain division, and enclose with their spurs, the most important of which are the Eagle creek mountains, the John Day, Umatilla, Grande Ronde, Powder river, and other valleys. Their peaks, 4,000–9,000 ft. high, though less lofty than those of the Cascade range, spring from a much more elevated and extensive upheaval. The Malheur and Owyhee valleys lie in the s. e., and there are several minor ranges, such as the Stein mountains, which stretch n. eastwardly from the Nevada line.

The coast of O., 300 m. in length, has among its capes and points, beginning with Point Adams at the mouth of the Columbia, Tillamook, Lookout, Foulweather, Gregory, Arago, Blanco, and Orford. The most southerly harbor is the mouth of Rogue river, at Gold Beach. At Port Orford, a few miles n., is a small bay furnishing partial protection from storms. The mouth of Coquille river is accessible to vessels of light draught. Coos bay, in lat. 43° 20′, is 10 m. long, 2 m. wide, with 18 to 24 ft. of water, and a changeable bar at its mouth that occasionally impedes entrance. The Umpqua mouth can be entered by vessels of light draught, and this rapid river is navigated by small vessels to Gardiner city, 35 m. Yaquina bay, at the mouth of Yaquina river, in lat. 44° 40′, is a wide estuary, with 10 to 12 ft. of water on its bar. Tillamook bay, in lat. 45° 34′, has an area of upwards of 6 sq. m., with 24 to 50 ft. of water at the entrance and in the bay. Nehalem river, in lat. 45° 41′ 30″, forms a bay 4 m. long, 8 m. wide, with an entrance 200 to 400 ft. wide, and 18 ft. at high tide. False Tillamook bay, a few miles n., is a small, round, secure harbor. All of the harbors named have a light-house or light-houses at their entrances, and several have jetties. Of the rivers flowing into the Pacific, the Umpqua and Rogue rise e. of the Cascade range and break through in deep cañons. The mouth of the Columbia, 5 m. wide, has a bar, but three channels give ample entrance way; the s., 2 m. wide, having 20 ft. of water at low tide; and the middle channel, recently opened, and about 1 m. wide, having a mean depth of 27 ft. Cape Hancock, on the n. of the entrance, has a light-house and fortification, and cape or Point Adams, on the s., has a light-house, and is defended by fort Stevens. There are many harbors on the Columbia, and vessels ascend it 159 m. to the Cascades. Here a fall of 26 feet was overcome by a canal constructed by the U. S. government, 3,000 ft. long, with 3 locks, completed in 1896. Above the Cascades there are 296 m. of steamboat navigation, interrupted only by the rapids of the Dalles. A ship railway

around the 8 m. of unnavigable rapids at this point would connect the interior navigation of e. O., Washington, and Idaho with tide water at Portland, and is receiving careful attention. E. and n. of the rapids in the "big bend" of the Columbia, which are less serious obstacles than those of the Dalles, navigation is unhindered for 400 m., and extends far into British Columbia. The river is from 2–4 m. wide from the seashore to the Cascade mountains, and above the Dalles, in its width, depth, and volume has been likened to the Mississippi. Its chief affluents are the Snake and the Willamette. The latter joins it 110 m. from the sea, and is navigable for sea-going vessels to Portland 12 m. from the Columbia, and for light steamers 175 m. above Portland, owing to a ship canal around the falls of the Willamette at O. city. Among the tributaries of the Willamette are the Tualatin, Clackamas, Yamhill, Santiam, Long Tom, McKenzie and Coast Fork. The Snake river, passing during part of its course through a cañon 2,000–3,000 ft. deep, receives the Grande Ronde, Umatilla, Burnt, Powder, Malheur, and Owyhee rivers. It is navigable to Lewiston, Idaho, 400 m. from Portland. The other chief tributaries of the Columbia, e. of the Cascade range, are the John Day and Umatilla flowing in from the Blue mountains and the swift and crooked Des Chutes. In s. O. there are many small lakes, some of them salt, some basins without outlets, and others which drain southward into the adjoining states. The principal ones are the upper and lower Klamath, Goose, Warner, Albert, Harney, and Malheur. Mystic or Crater lake, lying in the crater of an extinct volcano w. of mount Scott, has an elevation of 7143 ft., has walls from 500–2,000 ft. high, varies from 853–1,996 ft. in depth, and is the deepest body of fresh water in North America. The surrounding country has been reserved as a park by the government. Mineral springs are numerous. The scenery of O. is unsurpassed both for pastoral beauty and rugged grandeur. The snow-covered peaks, the park-like valleys, the precipices and pillared rocks of the Columbia, and its deep gorges, as at the great Dalles, where the mighty river, "turned on edge," is not much more than 20 ft. across; the awful cañon of the Snake; the beautiful waterfalls: Multnomah, Latourette, Willamette, etc.; Minto, Snoqualmie, Stampede, and other great passes in the Cascade range; and the extensive caves in Josephine co. and elsewhere, may be instanced.

Geology.—The geologic formations of O. are the eozoic, illustrated by the Coast range and the Blue mountains; the volcanic, by the Cascade range and the e. and e. central part of the State, where are numerous ranges and hills of obsidian; the tertiary, along the Pacific coast, the Willamette valley, the upper portion of the Umpqua valley, the Grande Ronde valley, and a large tract in s. middle O.; the cretaceous, in the upper valleys of the Des Chutes, Crooked, and John Day rivers, where, as also in the Grande Ronde valley and near Christmas lake in s. O., the principal fossil beds are located. The glacial, Champlain, and terrace epochs are well represented. For a long period the region w. of the Rocky mountains was covered by the sea. The Sierra Nevadas were uplifted after or near the close of the Jurassic period, but did not attain their great height until the end of the miocene period, when, with the elevation of the Coast range, great floods of lava were ejected from the Cascade range, covering nearly the whole of O., Washington and Idaho, and extending over n. California, Nevada, and into British Columbia to a depth of from 2–4,000 ft., as most strikingly shown in the cañons of the Columbia and Snake. The eruptions then became confined to a few points along the chain, and at these the crater peaks now existing were formed. The soil consists largely of a rich, dark loam, of great depth, caused by the disintegration of the basaltic rocks, or, as in w. O., of decomposed granite, gneiss, or sandstone, often on clay or marl subsoil.

Climate.—The climate of O. w. of the Cascade range, tempered by the warm Japan current and characterized by wet and cloudy weather during winter and the greater part of autumn and spring, is nevertheless dry, and free from extremes of heat and cold. The average temperature in spring is 52° Fahr.; in summer, 67°; in autumn, 73°; in winter, 39°. The mercury rarely falls below 20°, and ice, where it forms at all, is thin. The rainfall varies from 72 in. at Astoria to 32 at Jacksonville, and the average yearly fall in the Willamette valley is 44–54 in. The rainy season is largely due to the moisture brought by the winds from the s. w., about 70 per cent. of those along the coast coming from that quarter; and this moisture, prevented by the Cascade range from passing eastward, to any great extent, leaves the interior part of the state relatively hot and arid in summer. Summer in w. O. includes about 4 months, with little or no rain, the temperature ranging from 60°–80°. The days are long and delightful, and the evenings and nights cool. The seasons in O. e. of the Cascade range, though subject to extremes of temperature, are, nevertheless, more equable than on the Atlantic coast. The annual rainfall is from 12–20 in., and the rainy season lasts from autumn till summer. The winters, beginning late in December, are in general so open that, as in w. O., stock do not require shelter. The mercury in the Columbia valley occasionally falls to 8° below zero, but in the counties bordering California the zero point is rarely reached, and as a rule, everywhere, snows are light, and in some counties lie but a few days. Though comparatively little rain falls in summer, and the mercury sometimes reaches 100°, irrigation is seldom necessary, the heat is mitigated by the rarity and dryness of the air, and the evenings and nights are cool. The interior mountain country, and the Snake river region are exceedingly hot in summer and cold in winter and have deep snows. Of O. as a whole it may be said that the air, even w. of the Cascade range, is dry,

that thunderstorms, hail, and heavy winds are rare, cyclones and drouth unknown, malarial diseases confined to a few localities, and that there are no diseases peculiar to the climate.

Mineralogy.—Gold, first discovered in 1852, in Jackson co., is still mined there, and in Josephine, Curry, Coos, and Douglas cos. In 1861, it was discovered on the head waters of John Day's river, also on the Burnt and Powder, and the e. part of the state is now the most productive, especially Baker, Grant, and Union cos. Previous to 1870 nearly all the mining was for gold. The great majority of the mines are placer. Silver occurs in quartz and galena at many points; Copper is found in oxides and carbonates w. of the Coast range in Douglas, Josephine, and Jackson cos., and in Union and Baker cos., and in the e. part of the state occurs principally in ledges. Iron ore, bog, hematite, and magnetic underlies nearly every part of the state, large deposits existing in Columbia, Clackamas, Tillamook, Columbia, Marion, Jackson, and Coos cos. Lignite coal is mined in many places, as in the Coast range, and in the Umpqua, Willamette, and Umatilla valleys. Limestone is most abundant in the s. w. cos.; cement stone is found in the Umpqua valley; marble quarries have been opened in several places, as in Josephine and Jackson cos.; granite, sandstone, syenite, and slate are abundant in w. O.; cinnabar, chrome, platinum, plumbago, gypsum, building sand, brick and potter's clays, and, along the coast, glass-sand are yielded, and the Klamath basin and other localities furnish steatite. Salt is obtained from springs in Jackson and Douglas cos. Chalcedony, agates, carnelians, and jaspers are found on the banks of the Columbia. The product of gold, 1895, was valued at $888,230 (1896, $1,300,000); of silver at $65,930; of coal, $247,901, — with the exception of 1888, the largest in the history of the state.

Zoology.—Among the native animals are the grizzly, cinnamon, and black bear, gray wolf, catamount, wild cat, coyote, so destructive to sheep, big-horned mountain sheep, found only on the high mountains, elk, white, and black-tailed deer and antelope. Among the fur-bearing animals are the silver fox, beaver, otter, polecat, muskrat, marten, and weasel. The common seal is abundant, especially in the Columbia. The rattlesnake, one of the few noxious reptiles, is occasionally encountered in e. O. Among the birds and wild fowl are the golden and the bald-headed eagle, California vulture, buzzard, the trumpeter and the American swan, brant, Canada goose, snow-goose, crane, cormorant, nearly every species of duck, 4 of albatross, 7 of gull, and 3 of pelican, with the snipe, plover, quail, grouse, pigeon, pheasant, raven, crow, robin, jay, woodpecker, snow-bunting, and humming-bird. The ring-necked Mongolian pheasant is among the domesticated fowls. The fish include salmon, sturgeon, halibut, brook and salmon trout, smelt and herring; the shell fish, oysters, clams, lobsters, crabs, and shrimps. The chief fish is salmon, of which there are 3 species, the principal one, *salmo quinnat*, often weighing from 30–60 pounds. All the rivers flowing into the sea, and the tributaries of the Columbia as well, are stocked with these fish.

Botany.—While the plains of e. O. afford little beside sage brush, dwarf pine, juniper and bunch grass, the mountain regions furnish many kinds of trees found in the w. part of the state, as the pine, fir, larch, cedar, maple, cotton-wood and willow, but it is in w. O. that the greatest variety exists, and the most notable examples are seen, especially in the families *pinus* and *abies*. The long-leaved pine of the mountains grows to the height of 170 ft., in straight trunks, without waste for lumber seven-eighths of their height, with a diameter of from 4–6 ft. The noble fir grows 200 ft. high, the Douglas spruce, or red fir, 300 ft. and 3–6 ft. in diameter; the white oak, 90 ft. The redwood (*sequoia sempervivens*) is found on the Coast range of enormous size, being sometimes 15 ft. in diameter. The wood is strong, light, easily worked, noxious to insects, and decays slowly. The coniferous trees of O. include 6 species of pine; among them the black or jack, sugar, silver, and yellow; the white (*A concolor*), lovely, and yellow fir, hemlock, spruce, mountain hemlock, larch, yew, cypress, yellow, red, and Orford cedar. Among deciduous trees are the live, black, and white oak, chinquapin, large-leaved maple, vine maple, mountain mahogany, ash, birch, aspen, alder, dogwood, laurel (madroño), rhododendron, and manzanita. The wild fruits and berries include grapes, plums, cherries, gooseberries, currants, etc. Among flowering shrubs and plants are the snowberry, syringa, myrtle (umbellularia), honeysuckle, wall-flower, lupine, dwarf sun-flower, epipactis, calypso, iris, crocus, and *quamash* or scilla. Ferns 6–8 ft. high are not uncommon in the Cascade mountains. Flax is indigenous in s. and e. O., and in moist valleys a species of clover is found. The *camas*, a bulbous rooted plant, and the *wapatu*, with a root resembling a potato, are used for food by the Indians.

Agriculture.—The greater part of O. is arable, and large crops are now raised on lands formerly used for grazing, or supposed to be unfruitful. Wheat, the chief product, yields an average of over 11,000,000 bushels, valued at about $8,000,000, and hay, the second largest crop, yields over 1,250,000 tons, value over $8,000,000. All the cereals do well; oats, in the Willamette valley particularly, but Indian corn does not flourish w. of the Cascade range, as elsewhere. The finest hops come from the McKenzie river. The flax of O. is of superior quality, and the production of fibre and of linseed oil is one of the most important industries. The native grasses are so nutritious that, except timothy, cultivated varieties have not been largely introduced. The wild peavine of the mountains and the bunch grass of the plains are invaluable for forage. The latter matures in July, and is cured by the sun without cutting. Salt grass is found in the s. and w. Lucerne and red and white clover are cultivated considerably. Squashes,

cucumbers, sugar beets, egg plants and other vegetables common in the eastern and middle states grow profusely, and sweet potatoes are raised in many localities. Apples, pears, cherries, plums, prunes and grapes grow almost everywhere, and in the eastern and southern cos., peaches, figs, persimmons, nectarines, almonds and English walnuts. Small fruits and berries of every description, native and introduced, abound. Insects injurious to fruit and vegetation are not common. Stock is easily raised, on account of the open winters and the abundant forage. While much attention is paid to stock-breeding in Western Oregon, the largest ranches are e. of the Cascade range, particularly in Crook, Grant, Baker and Union cos. The wool of Oregon, notably that of the Willamette Valley is equal to Australian wool, and brings a higher price than that of other states. Of the various improved breeds, the merino is preferred. The Angora goat has been successfully introduced.

South Western Oregon is peculiarly adapted to dairy farming, and Western Oregon to bee-culture. The hop-gardens of Willamette yield 2,500,000 pounds yearly. The prune orchards of the Willamette Valley are the most productive in the United States. Here, too, are the chief dairy-farms. In 1896 Oregon had over 2,600,000 sheep, with a wool-clip of nearly 20,000,000 pounds.

Public Lands.—There are United States land offices in the state, located respectively at Oregon City, Roseburg, the Dalles, La Grande, Lakeview, and Burus. Under the pre-emption law a citizen may enter or pre-empt, on payment of a fee of $3, the right to purchase 160 acres either within or without the limits of a railroad grant at the rate of $2.50 per acre for the former, and $1.25 for the latter. The grants to the Oregon and California, and Oregon Central railroad companies, comprise the odd-numbered alternate sections within 20 m. on each side of the road to the extent of 12,800 acres per mile. The companies sell their lands at from $1.25 to $7 per acre, 10 per cent. off for cash, or on 10 years' time with interest at 7 per cent., one-tenth of the principal to be paid yearly. The United States have made extensive surveys, so that there are vast tracts of good land for sale under the homestead and pre-emption laws. The state also has for sale a large quantity of desirable lands granted by the government. Its chief land office is at Salem.

Manufactures and Industries.—The available supply of water at Oregon City, is estimated at 1,000,000 horse power, and the Santiam, Tualatin, Clackamas and other rivers afford superior facilities for manufacturing. The leading products are lumber, flour, woolen goods, malt liquors, machinery, tin, copper, and other ware, sashes, doors and blinds, furniture, cheese and butter (factory), saddles and harnesses, iron and steel; establishments, 1890, 1,523; hands, 18,798; capital, $32,122,051; wages paid, $11,535,229; val. material, $21,793,578; val. products, $41,432,174. The salting and canning of salmon stands second in the list of important industries. The first cannery, with two boats, was established in 1866 by the Messrs. Hume of Maine, and the first pack, 4,000 cases, was valued at $64,000. In 1896 the capital invested in the industry was nearly $1,500,000, and the value of the output, over 2,500,000. The salmon fisheries and canneries on the Oregon side of the Columbia employed over 4,300 persons, and those on the coast streams and bays, over 1,000. On the Columbia the various plants packed over 463,000 cases, valued at over $2,250,000, and the plants elsewhere packed over 87,000 cases, value nearly $270,000. The cost of the fresh fish was about $1,000,000. In 30 years the salmon industry yielded $70,000,000. Lubricating and leather-tanning oils are made from the refuse. (See Salmon.) Portland alone manufactures goods to the value of $25,500,000 per annum. There are great lumbering mills at Coos Bay, at Astoria, and along the Lower Columbia, and this industry is rapidly increasing. Stoves and brick are made at Salem.

Commerce.—The state has U. S. customs districts and ports of entry; for s.w. Oregon, at Coos Bay, the headquarters of the coal and lumber trade in that section; for the Columbia river, at Astoria; and for the Willamette, at Portland. The commercial importance of the water route is second only to the Mississippi. The commerce upon the Columbia and Willamette rivers has assumed a great magnitude by regular lines of steamers connecting with railways and canals around the falls. Smaller boats and rafting contribute largely to swell its volume.

Previous to 1868, the exports were mainly to the Sandwich Islands, Puget Sound, and San Francisco, and gold dust and ores formed three-fourths of them. The imports of merchandise in the calendar year 1896 aggregated $1,542,189, from Great Britain, Australasia, British Columbia, China, Belgium, and Japan in their order; and the exports, $7,380,408, to Great Britain, British Columbia, Argentina, Australasia, Chile, China, and Japan in their order. The state has a large interstate trade by rail and water, and a considerable portion of its products is distributed through San Francisco. Portland is a great commercial center because of its splendid railway connections and steamship lines which run to Japan, Alaska, British Columbia, and San Francisco; while sailing vessels ply to China, South America, New York, and Europe. Astoria also cherishes a considerable commerce. The new U. S. government canal and locks at the Cascades and the projected improvements at the Dalles will render the Columbia and the Snake rivers navigable for steamboats for their entire length.

Railroads.— The principal railroads are the Northern Pacific, the Oregon Railroad and Navigation Co.'s line, the Washington and Columbia River, the Oregon Central

and Eastern, the Southern Pacific, and a branch of the Great Northern. Nearly all of these lines lease minor ones. The total length of all lines within the state is about 2,000 miles; capital stock, $51,500,000; funded debt, over $49,000,000; total investment, over $100,000,000; cost of roads and equipments, about $86,000,000; net earnings, $1,000,000. The Oregon Railroad and Navigation company has valuable franchises and owns or controls many ocean, sound, and river steamers.

Religion, Education, etc. — The leading denominations, numerically, are the Roman Catholic, Methodist Episcopal, Baptist, Disciples of Christ, Presbyterian, Congregational, Methodist Episcopal (South), Protestant Episcopal, and United Brethren. There are about 1,000 religious organizations, 600 church edifices, and over 300 halls used for religious purposes, 70,000 communicants, and church property valued at nearly $3,000,000. The state constitutes a Protestant Episcopal diocese, with bishop's seat at Portland, and a Roman Catholic archdiocese, with archibishop's seat, also at Portland. The state board of education consists of the governor, secretary of state, and a superintendent of instruction, all elected quadrennially. County superintendents are elected biennially, and officers of district boards, every three years. Women are eligible to the office of school director, and widows with children to educate, and owning taxable property in the district, may vote in school meetings. Congress, in 1848, gave Oregon one-eighteenth of all the public domain (3,387,520 acres) for public schools, 26 townships (500,000 acres) for a state university, and 90,000 acres for an agricultural college. From the proceeds of the sales of a portion of these lands an irreducible fund of $500,000 has been secured. The sparse settlement of a large part of the state makes the maintenance of schools difficult in many places. The state superintendent reported for 1896, school population, 129,623; enrollment, 87,212; school districts, 1,891; teachers, 3,317; value of public school property, $2,988,312. The state expends over $1,250,000 annually for public education. There are state normal schools at Monmouth, Drain, Ashland, Weston and Gold Beach. The university of Oregon at Eugene, established 1872, and endowed at the start with $50,000, is controlled by 9 directors, 6 of whom are appointed by the governor. Pacific university and Tualatin academy at Forest Grove, are under Congregational control; Willamette university, Salem, is Methodist Episcopal; McMinnville college, McMinnville, Baptist; Portland university, University Park, Methodist Episcopal; Pacific college, Newberg, Friends; Philomath college, Philomath, United Brethren; Corvallis college, Corvallis,, Methodist Episcopal; Blue Mountain university is located at La Grande. The state agricultural college is at Corvallis. Willamette university gives instruction in law, and the University of Oregon has a law department at Portland, where also is situated the medical department of Willamette university. There is a successful Indian training school at Chemawa, and at Salem a school for deaf mutes and one for the blind. At Salem are also situated the State insane asylum, the penitentiary, and the State reform school; and there is a soldiers' home at Roseburg.

Banks. — The oldest national bank west of the Rocky Mountains is the First National Bank of Portland, established in 1865. In 1896 there were 33 national banks in operation, with a combined capital of $3,170,000, deposits $8,120,015, and reserve $3,447,485; 15 state banks, with capital $818,550, deposits $646,848, and resources $1,686,705; and two stock savings banks, with capital $300,000, deposits $972,298, and resources $1,543,206.

Government, etc. — The constitution, adopted in 1857, authorizes any male citizen of the United States, 21 years old, and six months a resident of the state, to be a voter, and any like foreigner who shall declare his intention to become a citizen one year before an election, and shall have been a resident of the state for six months. General elections are held biennially on the first Monday of June of even years. To amend the constitution the amendment must pass two successive legislatures, and be approved by popular vote. The governor, secretary of state (who is auditor and comptroller) and state treasurer are elected for four years. The legislature has a senate of 30 members elected for four years, and a house of representatives of 60 members elected for two years. They meet biennially; sessions are limited to 40 days. The salaries of the governor and secretary of state are $1,500 each; treasurer, $800 and fees; attorney-general, $3,000 ; and members of each house, $3 per day, besides fees. The judiciary consists of a supreme court of three judges, situated at Salem, and having appellate jurisdiction, and elected for six years; five circuit courts, presided over by one of the judges of the supreme court, having civil and criminal jurisdiction, and appellate jurisdiction from the county courts; and county courts with one judge, elected for four years, who is also judge of probate. The circuit court judges are elected one-third every two years. There is also a U. S. district court, and for Oregon, California, and Nevada, a U. S. circuit court. One or more justices of the peace are elected in every township or mining district, and have jurisdiction in cases involving $250 or less. Judges of the supreme court can be removed by the governor upon the joint resolution of two-thirds of the legislature. A state printer and superintendent of public instruction are elected every four years. The registration of voters is not required. New ballot laws, based on the Australian system, were adopted in 1891. The legal rate of interest is eight per cent.; allowed by contract, ten per cent. Judgments outlaw in ten years, notes and open accounts in six years. Divorce laws are similar to those of Colorado (q. v.). Residence required, one year. Women may practice law in Oregon, and a

wife has sole control of property owned by her at marriage or subsequently acquired. The National Guard was organized in 1883, and did good service during the Chinese agitation in 1886. The total active force is over 1,600, and the total available for service in time of war, 58,000. There is a fine armory at Portland.

FINANCES. — The constitution prohibits the legislature from contracting any state debt exceeding $50,000, or assuming the debt of any county, town, or corporation, and limits each county to $5,000 of indebtedness, "except to repel invasion or suppress insurrection. The state practically has no debt, the sole liabilities being bonds aggregating less than $2,000, of which nothing can be learned. The assessed property valuations for the tax levy of 1897 as equalized amounted to $143,345,967.

Oregon sends to Congress two senators and two representatives, and has four votes in the electoral college; these have been cast as follows: 1868, for Seymour and Blair; 1872, Grant and Wilson; 1876, Hayes and Wheeler; 1880, Garfield and Arthur; 1884, Blaine and Logan; 1888, Harrison and Morton; 1892, Harrison 3, Weaver 1; 1896, McKinley and Hobart.

POPULATION. — The immigration prior to 1859 was chiefly from the following states, in numerical order: Ohio, Missouri, Kentucky, New York, Illinois, and Virginia. The pop. in 1842 included 240 white persons; in 1850 it was 13,294; 1870, 90,923; 1880, 174,768; in 1890, 313,767. The Indians in 1890 living on reservations numbered about 3,078, located as follows: the Coast Indians, at Siletz river, on the Pacific coast, 75 miles south of the mouth of the Columbia: the Grande Ronde, near the coast, 60 miles south of the Columbia; the Klamath Indians, just east of the Coast range, near the California line; the Warm Springs Indians, on the 45th parallel, 40 miles south of The Dalles; the Malheurs, in the eastern part of the state, near the 44th parallel, and the Umatillas, about 30 miles southeast of Walla Walla. For the counties with populations, see the Census Tables, at the end of Vol. XV. The largest towns are Portland, pop. '90, 46,385; East Portland (since annexed to Portland), 10,532; Astoria, 6184; Oregon City, 3062; Albany, 3079; Albina, 5129.

See histories of Oregon by Bancroft and by Barrows; Himes's *History of the Willamette Valley* and the *Proceedings* of the "Pioneer Association."

OREGON, a co. in s. Missouri adjoining Arkansas, watered by the Spring and Eleven Point rivers; 780 sq.m.; pop. '90, 10,257. The surface is uneven, broken with hills, heavily wooded; the soil is fertile. The principal productions are corn, wheat, and oats. Co. seat, Alton.

OREGON RIVER. See COLUMBIA RIVER.

OREIDE. An alloy introduced by the French as a substitute for ormolu, which it excels in its gold-like character. There are two formulas for composing it. In the first the ingredients are: copper, 100.0; tin, 17.0; magnesia, 6.0; sal ammoniac, 3.6; quicklime, 1.80; argols, or unrefined tartar, 9.0. In the second, zinc is substituted for the tin. The latter does not possess the same brilliancy as the former.

O'REILLY, ALEXANDER, Count, 1722–94, born in Ireland. He went to Spain at an early age, became a soldier in the Spanish army, and served in Italy in the war of the Austrian succession. He served for a short time in the armies of France and Austria, and then re-entered the Spanish service, where he was brigadier-general and afterward inspector-general. In 1768 O'Reilly was sent to Louisiana, which had been ceded to Spain in 1762. Here he put down the disaffection of the French, and in so doing committed many tyrannous and cruel acts.

O'REILLY, JOHN BOYLE, author, was born at Dowth Castle, County Meath, Ireland, in 1844; studied at a private school; learned to set type, and subsequently became a reporter for London newspapers. In 1865 he enlisted in the British army for the purpose of inducing Irish soldiers to desert, and on detection, 1866, was sentenced to fifteen years' penal servitude in Australia. In 1869 he escaped to the United States on an American whaler and settled in Boston, where he continued literary work and in time became editor and part owner of the *Pilot*. He died in 1890. He was the founder of the Papyrus Club of Boston and was highly esteemed for his talents, social qualities, and sturdy Americanism. He was author of the volumes of verse, *Songs from the Southern Seas* (1872); *Songs, Legends, and Ballads* (1876); *Statues in the Block* (1881); *In Bohemia* (1886); and *Poetry and Song of Ireland* (1887); besides *Moondyne*, a story of penal life (1877); *The Evolution of Straight-weapons; Athletics*, etc.

O'REILLY, PATRICK THOMAS, D.D., born in Ireland, 1833; came to the United States when young, and studied at St. Charles' college, Md., and at St. Mary's seminary; was ordained a Roman Catholic priest, 1857; labored as a missionary and pastor, and was consecrated Bishop of Springfield, Mass., 1870. He d. in 1892.

O'REILLY, PRIVATE MILES (*pseud.*). See HALPINE, CHARLES G.

OREL, a government in the southwest of Central Russia, bounded on the west by Little Russia and the government of Smolensk. In the n.w. are iron mines. Area, 18,042 square miles; pop. '93, 2,140,130.

OREL, a thriving t. of Great Russia, capital of the government of the same name, stands on the Oka, at its confluence with the Orlik, 226 m. s.s.w. of Moscow, and 678

m. s.s.e. of St. Petersburg. It was founded in 1566, as a stronghold in defense of what was then the Russian frontier, against the inroads of the Tartar tribes of the Crimea. Its importance as a fortress ceased after the annexation of Little Russia, and it then became a commercial town. The town owes much to its advantageous position on a navigable river in the midst of the most fertile provinces of Russia. The railway from Moscow to Odessa, on the Black sea, passes through Orel, and the Vitebsk line affords it direct railway communication with the port of Riga, and thus its export trade has been greatly promoted. It is the seat of a bishop, and contains numerous churches; its houses are for the most part constructed of wood. There is an important ferry here over the Oka. The chief manufacturing establishments in the town, are yarn and rope factories. The principal articles of export are cereals and hemp, hemp seed, corn, oil, ropes and tallow. On June 7, 1848, Orel suffered severely from a great fire. Pop. '92, 81,935.

O'RELL, Max, *pseudonym* of Paul Blouet, was born in France in 1848; educated in Paris; served in the Franco-Prussian war, and taught French (1874–84) in England. He has visited the United States. His publications include *John Bull and his Island* (1883); *John Bull's Daughters* (1884); *Friend MacDonald* (1887); and *Jonathan and his Continent* (1889); *A Frenchman in America* (1891); *English Pharisees and French Crocodiles* (1892); *John Bull & Co.* (1894).

ORELLÁNA, Francisco, d. about 1550; b. Spain, went to Peru in 1535, in the expedition commanded by Francisco Pizarro, participated in the contest which conquered the country, and was the first European who crossed the continent of South America. He was of respectable family and went to America to better his fortunes. In 1540, with Gonzalez Pizarro (brother to Francisco), Orellána, as second in command of 350 Spaniards, 4,000 Indians, and 1000 dogs (for hunting natives), penetrated the forests and climbed the snow-clad Andes mts. between Quito and the country beyond, which was reported to abound in gold, silver, cinnamon, etc. Many hardships and misfortunes were met, and the explorers were shaken by earthquakes, overtaken by tempests, and drenched by floods, which cut off their means of communication, and reduced them to the greatest straits. After many trials of endurance they reached the province of Zumaco, and were cheered by the sight of the cinnamon tree growing in great abundance. They had been subsisting on roots and berries, while following the course of a river supposed to be the Napo, a branch of the Marañon for 200 leagues, and had nearly exhausted their supply, when Orellána was ordered down the river with the bark which they had built—large enough to hold their baggage—manned with 50 soldiers. They were warned to keep near the army which would follow by land, and after procuring provisions the orders were to return immediately, leaving the baggage where they loaded the provisions. He proceeded down the river till he came to the place where it joined the Amazon, made no discoveries of the means of subsistence, but was the first European to navigate that stream. He parted with his commander at this point and proceeded down the river, the voyage lasting 7 months, and his party were reduced to the extremity of hunger, eating their shoes and devouring their saddles. Many deaths occurred from skirmishes with the natives, and mutinies broke out among the crew, which only his firmness quelled. He reached the coast in August, 1541, having passed over 1000 leagues of the river. From its mouth he sailed to the island of Cubagua and thence to Spain carrying glowing accounts of the El Dorado, and embellishing his story with descriptions of the marvelous race called the Amazons, who were female warriors, and dwelt by the banks of the river which had no male population, and where gold was so plenty that the roofs of the temples were made of gold. He readily induced a company to join him, and the king of Spain granted him extensive possessions and a commission to colonize El Dorada. He set out with 4 ships and 400 men in 1549, but he lost one ship and 150 men before reaching Teneriffe. He arrived at the mouth of the Amazon near Montealegre, but every vessel in his fleet was wrecked, and he d. shortly after of malarial fever.

ORELLI, Johann Kaspar, an eminent philologist and critic, was b. at Zürich. Feb. 13, 1787. His father was long the *Landvogt* of Wädenschweil. He studied in the *Carolinum* at Zürich, and betook himself enthusiastically to the study both of the ancient and of modern languages and literature. In 1806 he was ordained as a clergyman. He spent some years as a tutor at Bergamo; and while there, published, in 1810, two parts of a work entitled *Beiträge zur Geschichte der Ital. Poesie.* In 1813 he became a teacher in the cantonal school at Chur; in 1819, professor of eloquence and hermeneutics in Zürich; and after the foundation of the Zürich high school, in which he took an active part, he was one of its chief ornaments. There never was a man more zealous in the cause of education. It was during this latter and most distinguished period of his career that he produced most of his learned works, and trained to a correct knowledge of antiquity a numerous band of scholars. His political sympathies and opinions were not, however, confined to the ancient world; he took the liveliest interest in the struggles of Greece for freedom, and in the political reformation of his native country. He died Jan. 6, 1849. Orelli edited many classical authors with great learning, taste, and acute discrimination; in particular, his editions of Horace (2 vols. Zür. 1837–38), Tacitus (2 vols. Zür. 1846–47), and Cicero (4 vols. Zür. (1826–31) deserve mention; also an *Onoma-*

sticon Tullianum (3 vols. Zür. 1836–38), executed in association with Baiter, and an *Inscriptionum Latinarum Selectarum Collectio* (2 vols. Zür. 1828).

ORENBURG, a Russian government in the Ural region, lies partly in Europe and partly in Asia, and extends between the governments of Tobolsk on the n.e. and Samara on the s.w. Area of the government, 73,816 sq.m.; pop. '95, 1,436,189. The governmant is divided into four districts — Orenburg, Verchne, Uralsk, Ovsk, and Troitsk and Tcheiabinsk. Capital, Orenburg (q.v.). Till 1865, Orenburg comprised within its area the whole of what is now the distinct government of Ufa (q.v.); but in that year the part of Orenburg lying to the n.w. of the Ural mountain range was organized into the new government. The populations, the surface, soils, flora, and fauna of this extensive country are of the most various kinds. The government is one of the most elevated in the empire; but it also contains extensive low-lying tracts and steppes. It is traversed by numerous navigable rivers, by means of which and by canals it is in communication with the Caspian and Baltic seas, and with the Arctic ocean. The main streams are the Bielaia (running into the Kama, a tributary of the Volga), the Tobol, and the Ural. As many as 2,300 larger and smaller lakes lie within the frontiers. Of the whole area, about three-tenths are forest, a half is waste land, and only about a twentieth part is cultivated. The hill country has much pleasant scenery, but great tracts of the steppe regions are utterly barren and desolate. The inhabitants are made up of Russians, Bashkir, Tartar, and Kirghis tribes, Kalmucks and certain Finnish peoples, with a few Germans. The trade is chiefly with Bokhara, Khiva, Tashkend, and the Kirgheez; the exports are gold, silver, and other metals, corn, skins, and manufactured goods; the imports, cattle, cotton—the demand for and supply of which have greatly increased since the commencement of the American war—and the other articles of Asiatic trade. The imports are either disposed of to Russian merchants in the custom-house on the frontier, or are carried by Asiatic traders into Russia, and sold at the great national market of Nijni-Novgorod. There are in the province numerous iron and copper works, as well as valuable gold diggings, both belonging to the crown and to private individuals. The salt mines are valuable. There is a small-arms factory on a large scale, and a few other factories. Cattle-breeding is very extensively carried on. The number of horses in Orenburg is larger than in any other Russian government. The southern frontiers are defended, at intervals of 12 or 12 m., by fortified settlements, inhabited by Cossacks; those on a larger scale being surrounded by a bulwark and a moat. This line of forts extends over a frontier of 2,000 m. eastward to the boundaries of China; the series from the mouth of the Ural to the Tobol, occupied by upwards of 290,800 Ural and Orenburg Cossacks, being known as the Orenburg line. The region of which Orenburg forms part was originally called Bashkir-land, and became subject to the Czar of Moscow in 1556. Besides the towns giving name to the governmental districts, the only other place of consequence is Mijask.

ORENBURG, a t. on the eastern frontier of European Russia, in the government of the same name, on the river Ural, 933 m. by rail s.e. of Moscow, lat. 51° 45′ n., long. 88° 6′ east. The foundation of the fortress and town were laid here in 1742. Pop. '91, 62,534. It is the centre of the governor-generalship of the government of the same name, has an excellent custom-house, and carries on an extensive trade with Kirgheez and other Asiatic tribes. It imports cotton, silk-stuffs, and shawls from Bokhara, Khiva, and Tashkend; tea (brought mostly on camels) from China; and sheep and cattle from the Cossacks and Khirghiz. The sheep are killed in autumn for the fat and skins, which are purchased by Russian merchants. Corn, skins, and metals are the principal exports. In the neighborhood is the very rich rock-salt mine of Iletsk. At Orenburg the Ural is frozen from Oct. till March.

ORENBURG GUM, an exudation of the larch tree, resinous and somewhat sweet in taste. It is gathered in quantities by the peasants of Siberia and Russia, and is an article of commerce, making a fair substitute for gum arabic.

ORENSE (anc. *Aquæ calidæ Ciliorum*, or *Aquæ Originis*), a city of Spain, the capital of the province of Orense, in Galicia, near the frontier of Portugal, on the left bank of the Minho. Orense contains a number of interesting ecclesiastical edifices. It is highly reputed for its hot sulphurous springs, called *Las Burgos*, which issue—three in number—almost boiling from a granite rock in the western part of the town. The baths of Orense were known to the Romans, and were in much repute among the Goths. Orense carries on manufactures of linen, leather, and chocolate. It has a large trade in hams, which are in great repute throughout Spain. Pop. '87, 14,168.

ORENSE, José Maria d'Albaida, Marquis, 1802–80; b. Spain; when a young man became imbued with republican principles and spent his life in endeavoring to establish a Spanish republic. He was many times arrested on charges of disaffection and conspiracy, and banished from the country. In 1868 he became a member of the cortes, and in 1870 was opposed to the enthronement of Amadeus. After the abdication of king Amadeus, 1873, he was again chosen a member of the cortes, but after a few months resigned his place.

OREODAPH'NE, a genus of trees of the natural order *Lauraceæ*, sometimes called Mountain Laurel. The fruit is succulent, partly immersed in a deep thick cup formed of the tube of the calyx. *Oreodaphne opifera* is a native of the countries on the lower part of the Amazon. A volatile oil obtained from the bark is used as a liniment, and when kept for a short time deposits a great quantity of camphor.—*Oreodaphne copularis* is a very large tree with strong-scented wood, the bark of which yields the cinnamon of Mauritius. It grows also in Bourbon and Madagascar.—*Oreodaphne fœtens*, a native of the Canaries, has wood (*Til-wood*) of a most disagreeable odor. *Oreodaphne bullata*, found at the cape of Good Hope, is also remarkable for the disagreeable odor of its wood, the *Stink-wood* of the colonists; but it is hard, durable, beautiful, takes an excellent polish, and is used in ship-building.

OREODONT'IDÆ, a family of extinct ungulates, found in the miocene and pliocene tertiary formations of North America. They are regarded as forming a link between swine and ruminants, but in outward appearance had but little resemblance to the former. The family has been divided into two sub-families, *oreodontinæ* and *agriochœrinæ*. In oreodontinæ the orbits were closed behind and the lachrymal bones were contained in well marked depressions. This sub-family included the genera *merycoidoden*, or oreodon, *eporeodon*, *merychochœrus merychyus*, and *leptanchenia*. In *agriochœrinæ* the orbits were incomplete, and the lachrymal bones were not contained in fossæ, but this sub-family is limited to one genus, *agrichœrus*. Oreodon may roughly be taken as the type of the family. It was an even-toed ungulate, about the size of a sheep, having swine characteristics on one hand, and those of the deer on the other: feet tetradactylous; metacarpals and metatarsals not anchylosed. Dental formula $i\,\frac{3-3}{3-3}$; $c\,\frac{1-1}{1-1}$; $p\,m\,\frac{4-4}{4-4}$; $m\,\frac{3-3}{3-3} = 44$. The incisors were small, the canines large, three-sided, and worn like those of the hog. A diastema separated them from the premolars, and the latter, as well as the molars, were of the ruminant type. A remarkable characteristic was the existence, beneath each eye, of a sinus called "larimer," or lachrymal sinus, a sebaceous gland possessed by the deer family (*cervidæ*), and which secretes a peculiar, strong-smelling, waxy substance.

ORES. Any mineral or combination of minerals containing as much metal as to be profitably extracted, is reckoned by miners an ore. The proportion necessary for this purpose is, of course, very various, according to the value of the particular metal and the facility or difficulty of *reducing* the ore. A rock containing only 1 per cent. of iron is never called an ore; one containing the same proportion of gold is a very rich ore. Metals rarely exist in ores in a pure or native state; they are almost always chemically combined with oxygen, sulphur, or other elements.

Ores present themselves in a multiplicity of forms and positions in the solid crust of the earth. Sometimes they are sprinkled through the whole mass of the rocks in which they occur, as is often the case with gold, tin ore, and magnetic iron ore. Sometimes they are deposited in regular parallel beds between the strata of other rocks, as in the case of many iron-stones and of cupreous schist. At other times they occur in irregular lumps or concretions; or they fill up the fissures of other rocks, forming veins, particularly silver, copper, and lead ores; or lastly, they are found in detritus, gravel, sand, and other alluvial deposits. This last form is evidently the result of disturbance and transport from some of the other positions above specified. And as the metallic parts of the mineral masses or rocks so disturbed and transported are the heaviest, and are insoluble in water, they are more concentrated in these deposits than in their original position, and can therefore be extracted with greater advantage. Such deposits are called *washings*, from the metal being separated from the other débris by the process of washing. Gold and platinum are mostly got in this way in the Ural and Altai mountains, and gold in Guiana, California, and Australia. Tin ore is also found in alluvial deposits in Cornwall and India. The reduction of ores is treated of under Metallurgy and the names of the several metals.

ORES'TES, legendary hero of several Greek tragedies, as the *Iphigenia in Tauris* of Euripides and the *Electra* of Sophocles; son of Agamemnon and Clytemnestra, and after the murder of the former by his wife and her lover Ægisthus was saved by Electra, his sister. When grown to manhood he was sent to Mycenæ by direction of the Delphic oracle, to avenge his father's death. He slew Ægisthus and Clytemnestra with his own hand, and in punishment for the matricide was hunted from country to country by the Eumenides (furies). Again he resorted to the Delphic oracle, and was told that he could free himself from persecution only by carrying off the statue of Diana from Tauris. There he was seized, and with his friend Pylades was about to be sacrificed to the goddess, when Iphigenia, the priestess, discovered that Orestes was her brother, and by her connivance they escaped and carried off the statue. Orestes became king of Mycenæ, and married the daughter of Menelaus.

OREUS. See Histiæa.

ORFA, or **Urfa.** See Edessa.

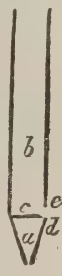
ORFORD, Earls of. See Walpole.

ORFILA, Mateo José Bonaventura, a celebrated physician and chemist, and the recognized founder of the science of toxicology, was b. at Mahon in Minorca, April 24, 1787. His father, who was a merchant, intended that his son should follow the same pursuit; but young Orfila showed so strong a predilection for the study of medicine, that all thoughts of a mercantile career for him were dismissed, and he was sent to the medical schools of Valencia and Barcelona. In the latter of these seminaries he so distinguished himself that the junta of the province resolved to defray the expense of his further education in Paris, on condition of his returning to Barcelona to fill one of the chairs in their medical school; and accordingly Orfila departed for Paris in 1807. The junta were prevented from fulfilling the agreement by the outbreak of war with France; but Orfila, who had now made many friends in Paris, was enabled to continue his studies. In Oct., 1811, he received the degree of doctor of medicine, and immediately commenced a private course of lectures on chemistry, botany, and anatomy, which was largely attended, and, along with his successful practice, soon rendered him famous. In 1813 appeared the first edition of his celebrated work on poisons, entitled *Traité des Poisons tirés des Règnes Mineral, Végétal, et Animal,* or *Toxicologie Générale* (Paris). The work was commended by the Institute, and rapidly passed through a number of editions. In 1816, on the occasion of a short visit to Minorca, he met with an enthusiastic reception; and on his return to Paris became court physician. In 1819 he was created a citizen of France, and became professor of jurisprudence; and in 1823 was transferred to the chair of chemistry, to which, in 1831, was added the deanship of the faculty. His prosperity was now at the full; his lectures were more popular than ever; his works were reckoned as masterpieces; and he himself, by the geniality of his disposition and his many accomplishments, was a universal favorite in society. In all cases of suspected poisoning he was a most important witness. From 1834 he was a member of the council of public instruction, and procured the passing of many useful measures, such as the creation of secondary medical schools and the multiplication of means of instruction and observation. He also organized the clinical hospital, founded a new botanic garden, and a museum of comparative anatomy, which is now known by his name. On the outbreak of the revolution of 1848 he was deprived of his place in the medical faculty on account of his conservative opinions, but retained his professorship. He died at Paris, Mar. 12, 1853. His great work on toxicology has gained for him undying fame; it is a vast mine of information, the result of the author's solitary indefatigable researches; and includes symptoms of poisoning of all kinds, the appearances in the body to which poisons give rise, their action, and the means for their detection. It is well written, and exhibits the accuracy of language equally with the sound judgment of its author. His other works are not nearly so famous, partaking more of the character of compilations; the chief of them are: *Élémens de Chimie appliqués à la Médecine* (Paris, 1817; 8th edition, 1851); *Traité de Médecine Légale* (1823–25; 4th edition, 1847); *Mémoires sur Plusieurs Questions Medico-légales* (Paris, 1839); and *Recherches sur l'empoisonnement par l'Acide Arsenieux,* etc. (Paris, 1841). He also contributed largely to various journals, dictionaries, encyclopædias, and other periodicals. He has left a number of memoirs, which have not yet been published.

ORGAN (Gr. *organon,* a contrivance requiring skill on the part of the user of it), a musical instrument played by finger-keys, and in general partly also by foot-keys, and consisting of a large number of pipes of metal and wood made to sound by a magazine of wind accumulated by bellows, and admitted at will by the player. The following description is necessarily restricted to the most fundamental arrangements of this very complicated instrument. As met with in cathedrals and large churches, the organ comprises four departments, each in most respects a separate instrument with its own mechanism, called respectively the *great-organ,* the *choir-organ,* the *swell-organ,* and the *pedal-organ.* Each has its own clavier or keyboard, but the different claviers are brought into juxtaposition, so as to be under the control of one performer. Claviers played by the hands are called *manuals;* by the feet, *pedals.* Three manuals, belonging to the choir, great, and swell organs respectively, rise above each other like steps in front of where the performer sits; while the pedal-board by which the pedal-organ is played is placed on a level with his feet. The condensed air supplied by the *bellows* is conveyed through wooden tubes or trunks to boxes, called *wind-chests,* one of which belongs to each department of the organ. Attached to the upper part of each wind-chest is a *sound-board,* an ingenious contrivance for conveying the wind at pleasure to any individual pipe or pipes, exclusively of the rest. It consists of two parts, an *upper board* and an *under board.* On the upper board rest the *pipes,* of which a number of different quality, ranged behind each other, belong to each note. In the under board is a row of parallel *grooves,* running horizontally backwards, corresponding each to one of the keys of the clavier. On any of the keys being pressed down, a valve is opened which supplies wind to the groove belonging to it. The various pipes of each key stand in a line directly above its groove, and the upper surface of the groove is perforated with holes bored upwards to them. Were this the whole mechanism of the sound-board, the wind, on entering any groove, would permeate all the pipes of that groove; there is, however, in the upper board another series of horizontal grooves at right angles to those of the lower board, supplied with *sliders,* which can, to a small extent, be drawn out or

pushed in at pleasure by a mechanism worked by the *draw-stops* placed within the player's reach. Each slider is perforated with holes, which, when it is drawn out, completes the communication between the wind-chest and the pipes: the communication with the pipes immediately above any slider being, on the other hand, closed up when the slider is pushed in. The pipes above each slider form a continuous set of one particular quality, and each set of pipes is called a *stop*. Each department of the organ is supplied with a number of stops, producing sounds of different quality. The *great-organ*, some of whose pipes appear as show-pipes in front of the instrument, contains the main body and force of the organ. Behind it stands the *choir-organ*, whose tones are less powerful and more fitted to accompany the voice. Above the choir-organ is the *swell-organ*, whose pipes are inclosed in a wooden box with a front of louvre-boards like Venetian blinds, which may be made to open and shut by a pedal, with a view of producing *crescendo* and *diminuendo* effects. The *pedal-organ* is sometimes placed in an entire state behind the choir-organ, and sometimes divided, and a part arranged on each side. The most usual compass of the manuals is from C on the second line below the bass staff to D on the third space above the treble staff; and the compass of the pedals is from the same C to the D between the bass and treble staves. The real compass of notes is, as will be seen, much greater.

Organ-pipes vary much in form and material, but belong to two great classes, known as *mouth-pipes*, (or *flute-pipes*) and *reed-pipes*. A section of one of the former is represented in the figure. Its essential parts are the *foot a*, the *body b*, and a flat plate *c*, called the *language*, extending nearly across the pipe at the point of junction of foot and body. There is an opening, *de*, in the pipe, at the spot where the language is discontinuous. The wind admitted into the foot rushes through the narrow slit at *d*, and, in impinging against *e*, imparts a vibratory motion to the column of air in the pipe, the result of which is a musical note, dependent for its pitch on the length of that column of air, and consequently on the length of the body of the pipe: by doubling the length of the pipe, we obtain a note of half the pitch, or lower by an octave. Such is the general principle of all mouth-pipes, whether of wood or of metal, subject to considerable diversities of detail. Metal pipes have generally a cylindrical section; wooden pipes a square or oblong section. A mouth-pipe may be stopped at the upper end by a plug called a *tompion*, the effect of which is to lower the pitch an octave, the vibrating column of air being doubled in length, as it has to traverse the pipe twice before making its exit.



Pipes are sometimes half-stopped, having a kind of chimney at the top. The *reed-pipe* consists of a reed placed inside a metallic, or occasionally a wooden pipe. This *reed* is a tube of metal, with the front part cut away, and a tongue or spring put in its place. The lower end of the spring is free, the upper end attached to the top of the reed; by the admission of air into the pipe, the spring is made to vibrate, and in striking either the edge of the reed or the air, produces a musical note, dependent for its pitch on the length of the spring, its quality being determined to a great extent by the length and form of the pipe or bell within which the reed is placed. When the vibrating spring does not strike the edge of the reed, but the air, we have what is called the *free reed*, similar to what is in use in the harmonium (q.v.). To describe the pitch of an organ-pipe, terms are used derived from the standard length of an open mouth-pipe of that pitch. The largest pipe in use is the 32-feet C, which is an octave below the lowest C. of the modern piano-forte, or two octaves below the lowest C on the manuals and pedal of the organ: any pipe producing this note is called a 32-feet C pipe, whatever its actual length may be. By a 32-feet or 16-feet stop, we mean that the pipe which speaks on the lowest C on which that stop appears, has a 32-feet or a 16-feet tone.

The *stops* of an organ do not always produce the note properly belonging to the key struck; sometimes they give a note an octave, or, in the pedal-organ, even two octaves lower, and sometimes one of the harmonics higher in pitch. *Compound* or *mixture stops* have several pipes to each key, corresponding to the different harmonics of the ground-tone. There is an endless variety in the number and kinds of stops in different organs; some are, and some are not continued through the whole range of manual or pedal. Some of the more important stops get the name of *open* or *stopped diapason* (a term which implies that they extend throughout the whole compass of the clavier); they are for the most part 16-feet, sometimes 32-feet stops; the *open diapason* chiefly of metal, the *close* chiefly of wood. The *dulciana* is an 8-feet manual stop, of small diameter, so called from the sweetness of its tone. Among the reed-stops are the *clarion*, *oboe*, *bassoon*, and *vox humana*, deriving their names from real or fancied resemblances to these instruments and to the human voice. Of the compound stops the most prevalent in Britain is the *sesquialtera*, consisting of four or five ranks of open metal pipes, often a 17th, 19th, 22d, 26th, and 29th from the ground-tone. The resources of the organ are further increased by appliances called *couplers*, by which a second clavier and its stops can be brought into play, or the same clavier can be united to itself in the octave below or above.

Organs are now generally tuned on the equal temperament. See TEMPERAMENT. The notation for the organ is the same as for the pianoforte, in two staves in the treble and bass clefs; but in old compositions the soprano, tenor, and alto clefs are used.

Instruments of a rude description, comprising more or less of the principle of the organ, seem to have existed early. Vitruvius makes mention of a hydraulic organ, but

his description is not very intelligible. The organ is said to have been first introduced into church music by Pope Vitalian I. in 666. In 757 a great organ was sent as a present to Pepin by Byzantine emperor, Constantine Copronymus, and placed in the church of St. Corneille at Compiègne. Soon after Charlemagne's time, organs became common. In the 11th c. a monk named Theophilus wrote a curious treatise on organ-building. But it was not till the 15th c. that the organ began to be anything like the noble instrument which it now is. The family of the Antignati, in Brescia, had a great name as organ-builders in the 15th and 16th centuries. The organs of England were also in high repute, but the puritanism of the civil war doomed most of them to destruction; and when they had to be replaced after the restoration, it was found that there was no longer a sufficiency of builders in the country. Foreign organ-builders were therefore invited to settle in England, the most remarkable of whom were Bernhard Schmidt (generally called father Smith) and his nephews, and Renatus Harris. Christopher Schreider, Snetzler, and Byfield succeeded them; and at a later period Green and Avery, some of whose organs have never been surpassed in tone. The largest English organs are those of York cathedral, Birmingham town hall, Christ Church, London; and a gigantic and exceedingly perfect instrument, completed in 1876 for the hall Primrose Hill, London. The latter surpasses in size the famous Haarlem organ, long reckoned the largest in the world, which is 103 ft. high and 50 broad. The German organs are remarkable for preserving the balance of power well among the various masses, but in mechanical contrivances they are surpassed by those of England.

For a full account of the structure of the organ see Hopkins and Rimbault, *The Organ, its History and Construction* (Lond. 1855). Rink's *Praktische Orgelschule*, Leipzig, v. y., is the best work on organ playing. See also Dr. Stainer's *The Organ* (1877).

In the organ the pipes are of wood or metal. Metal pipes consist of tin, pure or with some alloy of lead, a common proportion being one-third tin with two-thirds lead. Heavy bass pipes are made of zinc. The fused metal is poured into a large box, from which it is drawn through a wide, shallow gate to the surface of a casting table, which may be 2½ ft. wide and 20 ft. long. If the metal have as much as 40 per cent of tin, when cooling the crystalizing tin forms spots upon its surface, and the spots vary in size with the quantity of tin present. The builder varies the quality of his metal to produce pipes of different sonorous qualities as his experience dictates. The material is then cut from the sheet, and formed into pipes on a mandril and very neatly soldered at the joint where the edges meet. For the sides and backs of wood pipes the builder chooses the clearest seasoned pine; for fronts he uses cherry, maple, apple, or pear. The inside is coated smoothly with glue, to fill the pores and give a more resonant surface. The stock must be thick enough to withstand the vibrations of the tone without producing a rolling effect. The speaking length of a pipe is the distance from the language to the end; the pipe is usually straight for convenience of manufacture, but may be bent in any direction or may even return upon itself, as is observed in the convolutions of tubes in cornets and horns.

Remembering that musical tones are caused by vibrations having a fixed and known rapidity, it is evident that a tone may exist in company with other tones whose rates of vibration are 2, 3, 4, 5 times as great, no fractional multipliers being used. The first tone of the series is called the fundamental tone, the others its harmonics. A trained ear will detect the presence of harmonics in all but the very simplest tones. A tone which is deficient in harmonics is thin and cutting; a succession of pure octaves has this quality; the addition of the intermediate tones gives fullness to the sound and binds all together into a more perfect compound. The tones emitted from both open and stopped diapasons are almost free from harmonics, and the defect is cured by opening at the same time other smaller pipes which yield the harmonics wanting in the larger pipes of stronger tone. The resulting tone has the same pitch as the fundamental, but richer in quality, in which the trained ear may also recognize the harmonics.

The tuning of metal pipes is effected by cutting a slit at the top of the pipe and rolling the metal down; the tone becoming sharper by this means. The tuner must not be rolled too low, for when rolled back cuts will be left at the sides, which will interfere with the voicing of the pipe. For tuning open wood pipes a sheet of metal is placed horizontally over the open edge covering a part of the orifice; if the end be more covered the tone is flatted, if uncovered the tone is made sharp. Stopped wooden pipes are tuned by a wooden plug, covered with leather, called a tampion; the tampion is depressed to sharpen, and withdrawn to flatten the tone. The scale of an organ pipe is the ratio of its diameter to its tone-length. A pipe of large diameter has a fuller tone than one of small scale. Open diapasons have largest scale, and string-toned stops have smallest scale. The length of the foot—the conical part below the mouth—does not affect the quality of the tone. The high cutting of the mouth gives a flute quality to a tone, and requires more wind, but if the mouth be cut too high the tone becomes unsteady; the mouth is said to be cut high when the vertical breadth of the opening is large. If the length of a pipe be doubled the tone is lowered an octave; hence, reckoning the semitones, the thirteenth pipe from a given letter has half, or double, the length, as the pipes are counted up or down the scale; but the seventeenth pipe will have half, or double, the diameter, and intermediate pipes diminish in the ratio of the diminution of their lengths.

The following table gives the peculiarities of most of the stops now in use:

Name.	Quality of Tone.	Tone Length.	Actual Length.	Dimensions of Largest Pipe.	Material.	Remarks.
Sub-Bourdon, or Manual Untersatz	Flute.	32	16	10¼ by 8.	Wood.	Used only in largest organs; rarely below tenor C°.
Double Open Diapason	Organ.	16	16	12 inches.	Metal.	French "Montre;" German "Principal."
Double Dulciana	Organ, Soft.	16	16	.....	Metal.	Lower octave mounted in front; if not, often of stopped wood; trebles 50 per cent tin.
Contra-Gamba	String.	16	16	.....	50 p. c. tin Zinc B.	Sometimes inverted cones, with bell mouth.
Æolina	Organ, Delicate.	16	16	.....	Metal.	Generally placed in choir; lower octave stopped wood.
Double Melodia	Flute.	16	16	.....	Wood.	Open, with inverted mouths; lower octave stopped wood.
Tibia Major	Flute.	16	16	.....	Wood.	With round mouths. Effective in giving body to tone of full organ.
Double Mouthed Bourdon	Flute.	16	8	.....	Wood.	Trebles of double depth, with two mouths, for greater volume of voice.
Bourdon Double Stopped Diapason	Flute.	16	8	.....	Wood.	Useful in supporting a chorus or a congregation; adding dignity to other stops.
Quintaton	Flute.	16	8	.....	Wood.	Low mouthed; sounds also the fifth.
Still Gedect	Flute.	16	8	.....	Wood.	High mouthed; clear tone; choir O.
Double Trumpet Bombarde	Reed.	16	16	.....	Zinc bodies.	Sub-octave trumpet; large organs.
Contra Fagotta	Reed.	16	16	....	Metal.	Sub-octave oboe; lower pipes bent to go in a swell box.
Euphone	Reed.	16	16	.....	Free reeds.	Clarinet tone; smooth and pleasant.
Open Diapason Principal	Organ.	8	8	.....	40 p.c. tin	Seventeen lower pipes usually in front of case.
Bell Diapason	Organ.	8	8	.....	Metal.	With sliding bells for tuning. Rarely used. French "Flute à Pavillon."
Horn Diapason	Organ.	8	8	.....	Metal.	Inverted cones; horn-like tone.
Gemshorn	Flute.	8	8	.....	Metal.	Conical, top ⅓ dia. of mouth; tone light, sympathetic.
Dulciana, or Dolce	Organ.	8	8	.....	Metal.	Small dia.; tone very gentle.
Æoline	String.	8	8	.....	Metal.	Tone softest in organ.
Dolcan	Flute.	8	8	.....	Metal.	Inverted cones; pleasing tone.
Gamba	String.	8	8	.....	Metal.	Slender: incisive quality.
Salicional	String.	8	8	.....	Metal.	Softer than gamba. Swell O.
Bell Gamba	String.	8	8	.....	Metal.	Conical, with bell; fuller tone than of gamba.
Viol d'Amour	String.	8	8	.....	Metal.	Like bell G, but softer.
Keraulophon	String.	8	8	.....	Metal.	Pipes like salicional, with holes near top.
Geigen Principal	String.	8	8	.....	Metal.	Violin quality; choir O.
Rohr Gedect	Flute.	8	8	.....	Metal.	Half stopped, with chimney.
Stopped Diapason	Flute.	8	4	.....	Wood.	Mild flute tone.
Gedect	Flute.	8	4	.....	Wood.	Mouths cut high; clear bell tone; smaller than stopped diapason.
Doppel Flute	Flute.	8	4	.....	Wood.	Large scale, double depth, with mouths on front and back; full tone.
Quintadena	Flute.	8	4	.....	Metal.	Low mouths; sounds also the fifth.
Melodia	Flute.	8	8	.....	Wood.	Bass, often stopped wood; tone clear and horn-like.
Clarabella	Flute.	8	8	.....	Wood.	More subdued than Melodia.
Portunal	Flute.	8	8	.....	Wood.	Clarinet quality.
Hohl-Flute	Flute.	8	8	.....	Metal.	Powerful hollow tone.
Philomela	Flute.	8	4	.....	Wood.	Small scale; very sweet and delicate.
Voix Celestes, or Unda Maris	Flute.	8	8	.....	Metal.	Two dulcianas to each note, one a little sharper than the other, producing a waving or tremulant effect
Bifra	Flute.	8 4	8 4	.....	Metal.	Two pipes to each note, with tremolo.

Name.	Quality of Tone.	Tone Length.	Actual Length.	Dimensions of Largest Pipe.	Material.	Remarks.
Trumpet	Reed.	8	8		Metal.	Powerful; loud solo-stop.
Tuba Mirabilis	Reed.	8	8		Metal.	Large scale trumpet, voiced with heavier wind pressure: often flaring fan-like at top of case, and finished with bells like trumpets.
Cornopean, or Horn	Reed.	8	8		Metal.	Powerful trumpet in swell O.
Oboe	Reed.	8	8		Metal.	Small scale with bell-mouth; delicate wailing tone.
Clarinet	Reed.	8	8		Metal.	With sliding bells; choir O.
Vox Humana	Reed.	8	8		Metal.	With tremolo and flutes; resembles a choir of voices.
Cor Anglais	Reed.	8	8		Metal.	Pipes enlarged between mouth and top.
Vox Angelica	Reed.	8	8		Free reeds.	Very delicate.
Musette	Reed.	8	8		Metal.	Conical pipes; soft tone.
Physharmonica	Reed.	..	..		Free reeds.	Free reeds in flat boxes.
Octave, or Principal	Organ.	4	4		Metal.	The stop to which the organ is tuned.
Violin	String.	4	4		Metal.	
Celestina	Organ.	4	4		Metal.	An octave dulciana.
Flute Harmonique	Flute.	4	8		Metal.	Perforated between mouth and top; overblown to speak an octave above their length; tone very full, flute-like.
Traverse Flute	Flute.	4	4		Wood.	Maple tubes, polished, with round mouths.
Flute Octaviante	Flute.	4	4		Metal.	Clear tone.
Night Horn	Flute.	4	4		Metal.	Large scale; horn-like tone.
Flute d'Amour	Flute.	4	4		Metal.	Delicate tone.
Wald Flute	Flute.	4	4		Wood.	Mouths inverted like melodia
Concert Flute	Flute.	4	4		Wood.	Large scale, full wind, mouth inverted.
Flute, à Chiminee	Flute.	4	4		Metal.	Half stopped, with chimneys.
Fagara	String.	4	4		Metal.	Stronger than violin.
Clarion	Reed.	4	4		Metal.	Octave trumpets.
Quint	Flute.	$5\frac{1}{3}$	$5\frac{1}{3}$		Metal, Wood.	Tuned a fifth above 8 ft. pitch.
Twelfth, Octave Quint, or Nasard	Flute.	$2\frac{2}{3}$	$2\frac{2}{3}$		Metal.	Tuned 12 diatonic tones above 8 ft. open diapason.
Gemshorn Quint	Flute.	$2\frac{2}{3}$	$2\frac{2}{3}$		Metal.	Same pitch as twelfth, but more delicate.
Fifteenth, Super-Octave, or Doublette.	Organ.	2	2		Metal.	Two octaves above 8 ft. pitch.
Piccolo	Flute.	2	2		Metal.	Same pitch as fifteenth; choir O.
Flageolet	Flute.	2	2		Metal.	Same pitch as fifteenth; swell O.
Harmonic Piccolo	Flute.	2	2		Metal.	Made like flute harmonique.

PEDAL STOPS.

Double Open Diapason, or Untersatz	Organ.	32	32	24 by 20, 30 inches.	Wood or Metal.	When of metal, the pipes are placed in front of case.
Double Bourdon	Flute.	32	16	15 by 12.	Wood.	
Bombarde	Reed.	32	32		Wood or Metal.	Used only in largest organs.
Open Diapason, or Principal	Organ.	16	16	14 by 12.	Wood or Metal.	Most effective of wood: the stop which gives majesty to organ-tone; causes building to tremble.
Bourdon, or Sub-Bass	Flute.	16	8	$8\frac{1}{2}$ by 5.	Wood.	Very valuable, as sub-bass for soft combinations, and in small organs strong enough for the full organ.
Dulciana	Organ.	16	16	9 by 7.	Wood or Metal.	Deep, smooth, mellow tone.
Violone, or Contra-Bass	String.	16	16		Wood.	Small scale; effect of double bass viol.
Gamba	String.	16	16		Metal.	Conical tube, with bell top.
Trombone	Reed.	16	16		Metal or Wood.	Powerful.
Bassoon	Reed.	16	16			Slender scale; delicate tone.
Quint, or Quintaulophon	Flute.	$10\frac{2}{3}$	$5\frac{1}{3}$		Wood.	Tuned a fifth higher than the 16 ft. diapason.
Violoncello	String.	8	8		Metal.	Sometimes wood.

PEDAL STOPS—CONTINUED.

Name.	Quality of Tone.	Tone Length.	Actual Length.	Dimensions of Largest Pipe.	Material.	Remarks.
Principal, or Octavo...	Organ.	8	8	.....	Wood.	Octave higher than 16 ft. dia.
Flote.....	Flute.	8	8	.....	Wood.	Like melodia.
Dolcissimo.....	Organ.	8	8	.....	Metal.	Soft; like manual dulciana.
Tromba.....	Reed.	8	8	.....	Metal.	
Super-Octave.....	Organ.	4	4	.....	.....	Loud stops, two octaves above 16 ft. dia.
Flauto.....	Flute.	4	4	.....	Wood.	Clear tone.
Clarina.....	Organ.	2	2	.....	Metal.	Loud tone; large scale, to give clearness to pedal organ.
Mixture, Acuta, Furniture, Sesquealtera, Cornet, Harmonies, Sharp, etc.....	.....	..	..	.....	.....	Compounds in which two to five pipes are opened by the same key; used with other stops to give fullness to harmony.

Organ-building has been carried to a perfection in the United States rivaled only by England. One of the largest organs in this country was in the Boston Music Hall; it was built by Walcker in Saxony; it was removed in 1884. It has 4 manuals, 89 stops, and 4,000 pipes. There are many organs built by Americans containing from 2,500 to 4,000 pipes, and from 50 to 60 stops, which compare favorably with European organs of equal size. Among the most noteworthy are the following: Trinity church, New York, built by Henry Erben; Plymouth church, Brooklyn, by E. and G. G. Hook; St. George's, New York, by Jardine and Son; Tabernacle, Brooklyn, by Jardine and Son; St. Bartholomew's, New York, by J. H. and C. S. Odell; Temple Emanuel, New York, by Hall and Labagh; and Holy Trinity, New York, by H. L. Roosevelt. One of the largest organs in America is in the Roman Catholic cathedral at Montreal, and was built by R. S. Warren of the same city. See SOUND.

ORGAN, ORGANIC, ORGANISM. The word *organ* is derived from the Greek *organon,* an instrument, and is sometimes employed almost in its original sense. But it has received a signification more peculiarly its own, and with which alone the word *organism* is connected, as the designation of any of the parts or members of a living body, the *organism* being the living whole, animal or vegetable, which these organs compose. The idea of an organism or of organization is almost as much involved in obscurity and difficulty as that of *life,* with which it is so closely connected. But it is observable that a living body is entirely composed of organs, and these themselves of other organs, until we come to elementary cells; and also, that all the parts are mutually dependent on each other; and therefore an organism has been defined as a natural whole, in which all the parts are mutually to each other means and end. The juice which nourishes a plant is elaborated by the plant itself, although the supplies are drawn from without. The leaves of a plant are produced by the stem, but react upon the stem in promoting its growth. This mutual dependence of parts strongly distinguishes an organism from a *machine,* in which the parts concur for a common end, to which each contributes in its own way, but in which each does not contribute to the support of all or any of the rest. In organisms, moreover, besides this support and maintenance of the different parts or organs, there is a provision for the production of new organisms of the same kind, the reproduction or propagation of the species, to which there is nothing analogous beyond the sphere of organic life. Amongst organic beings, as we ascend in the scale from the lowest kinds of plants and animals to the highest, we observe an increasing number of organs and of functions of organs. In the animal kingdom organic life appears as possessed of sensation and spontaneous motion; whilst plants are limited to growth, assimilation, and propagation. The question as to the nature of organic processes connects itself with a most difficult question as to the relation of chemical processes with psychical functions, chemical processes being certainly carried on, but singularly modified or directed by the living powers of the organic being.—The term organic is frequently applied to those things in which an analogy is traced to living creatures, in the mutual dependence of parts. Such an analogy may be traced in social life and in political life; and the more perfectly this relation of mutual dependence or mutual usefulness is established the better is the state of things, social or political. It is also the highest praise of a work of art that it suggests this idea of an organic relation of its parts to each other and to the whole.—*Organic laws* are those which are fundamental or most essential to the system to which they belong.

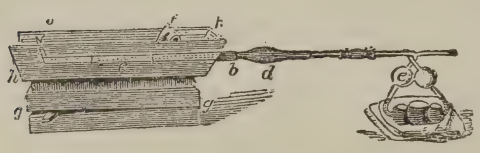
ORGANIC ANALYSIS. When a complex organic substance is submitted to chemical examination the first point is to determine its *proximate* constituents, or, in other words,

the several definite compounds of which it is made up. Opium, for example, is thus found to have as its proximate constituents meconic acid, morphine, codeine, and some 10 or 12 other substances. The modes by which these proximate constituents are separated are various; the chief being the action of certain solvents, such as ether, alcohol, and water, which extract some of the materials and leave others undissolved. Thus ether is the special solvent of fatty and waxy matters, resins, and camphors; alcohol dissolves the same substances with less facility, but on the other hand takes up many substances which are insoluble in ether; while water, which scarcely acts upon the above-named matters, dissolves saccharine, gummy, and starchy matters, and salts of organic acids. The proximate constitutents being thus determined, the next point is to determine their qualitative and quantitative (or ultimate) composition; and it is to these processes—especially the last—that the term *organic analysis* is for the most part restricted.

Qualitative Analysis.—It is shown in the article Organic Compounds, that the ordinary ingredients for which we must seek are carbon, hydrogen, oxygen, nitrogen, and sulphur. *Carbon* and *hydrogen* may be simultaneously detected by burning the compound (which must be previously well dried) in a glass tube in contact with oxide of copper, which readily yields up its oxygen. The carbon is thus converted into carbonic acid, which, if passed into baryta water, forms a white precipitate of carbonate of baryta, and the hydrogen into water, which collects in drops in a small cooled receiver attached to the tube. Carbon may also be usually recognized by the black residue which almost always remains on burning an organic matter, especially in a narrow test-tube in which there is little air. The presence of *nitrogen* may in many cases be readily ascertained by heating a portion of the substance in a test-tube with an excess of hydrate of potash, when a distinct odor of ammonia is perceived. *Sulphur* is detected by igniting the compound with hydrate of potash and niter, whereby sulphuric acid is formed; and phosphorus and arsenic may be detected by the same means. The presence of *oxygen* cannot, as a general rule, be directly determined.

Quantitative Analysis.—The first attempts to determine the quantitative composition of organic bodies were made, more than half a century ago, by Gay Lussac and Thenard. The process originally proposed by them has been modified and improved by various chemists, especially by Berzelius, Prout, and Liebig, and it is mainly owing to the great simplifications introduced by the last-named chemist, and to the consequently increased facility of conducting an ultimate analysis, that our knowledge of the composition of organic bodies has so vastly enlarged during the last 20 years.

The operation is always effected by causing complete combustion of a known weight of the body to be analyzed, in such a manner that the carbonic acid and water which are formed in the process shall be collected, and their quantities determined, from which, of course, the carbon and hydrogen they respectively contain may be readily calculated. The apparatus required for the analysis of a compound containing carbon, hydrogen, and oxygen only, consists of (1) a *combustion tube*, composed of hard white Bohemian glass, having a diameter of half an inch or less, and a length of from 14 to 18 inches. One end is drawn out in a point and closed, while the edges of the other (or open) end are made smooth by fusion in the blow-pipe flame. (2.) A thin sheet-iron furnace, in which the tube is placed and supported during combustion. (3.) A small light tube (which may be either a bulb-tube, as in the figure, or a U-tube, which is filled with fragments of spongy chloride of calcium to absorb the watery vapor that is driven through it; and (4) Liebig's bulb-apparatus (see illus., Chemistry, volume III., fig. 4), containing a solution of potash of specific gravity 1.27, for the purpose of absorbing the carbonic acid. The chloride-of-calcium tube is connected by a well-dried perforated cork to the open extremity of the combustion tube, and by a little tube of flexible caoutchouc, secured by silk cord, to the potash apparatus.



a, *b*, the combustion tube; *c*, the central portion, in which the mixture to be analyzed is placed; *d*, the bulb-tube, containing chloride of calcium; *ee*, Liebig's potash apparatus; *f*, a moveable iron screen; *gg*, bricks supporting *hh*, the furnace.

In performing an analysis a little freshly prepared oxide of copper is first introduced into the combustion tube, then a mixture of about 5 grains of the substance to be analyzed, with an excess of the oxide, while the tube is lastly filled to within an inch of its open mouth with the oxide alone. The tube is then placed in the furnace, which may be heated with charcoal or gas. (Hofman's gas furnace, in which is a peculiar form of burner called the *atmopyre*, is the best. It is described in vol. xi. of *The Journal of the Chemical Society*.) Red-hot charcoal is now placed round the anterior part of the tube, containing the pure oxide of copper; and when this is red-hot, the fire is slowly extended towards the further extremity by shifting the movable screen shown in the figure. When the tube has been completely heated from end to end, and no more gas is disengaged, the charcoal is gradually removed from the further extremity of the tube, and the point of the latter broken off; after which a little air is drawn through the whole apparatus, so as to secure any remaining carbonic acid and watery vapor. The parts are then

detached, and the increase of weight of the chloride-of-calcium tube and potash apparatus is determined by an accurate balance. The following account of an actual analysis of crystallized cane-sugar (borrowed from Fownes's *Chemistry*) will serve to illustrate the preceding remarks:

	Grains.
Quantity of sugar employed	4.750
Potash apparatus, after experiment	781 13
" " before experiment	773.82
Carbonic acid	7.31
Chloride-of-calcium tube, after experiment	226.05
" " " before experiment	223.30
Water	2.75

7.31 grains carbonic acid = 1.994 grains carbon, and 2.75 grains water = 0.3056 grains hydrogen: or in 100 parts of sugar, carbon, 41.98; hydrogen, 6.43; oxygen by difference, 51.59.

For the methods of determining other elements quantitatively, such as nitrogen, chlorine, sulphur, phosphorus, etc., we must refer to the various works that have been published on organic analysis, amongst which those of Liebig, Fresenius, and Rose deserve special mention. See illus., Chemistry, vol. III.

ORGANIC BASES. The present remarks must be regarded as supplementary to the article Alkaloids. They refer (1) to the classification of organic bases and (2) to their formation.

(1) From the fact that nearly all artificial organic bases are (as will be afterward shown) actually constructed from ammonia, and that whether artificially or naturally formed, they exhibit the property of basicity, which is the leading characteristic of ammonia, chemists have been led to refer organic bases generally to the typical body ammonia, and have succeeded in demonstrating that they are constructed upon or derived from the simple type NH_3. Berzelius believed that all the alkaloids actually contained ammonia as an ingredient of their composition, a view which is now untenable; and it is to Liebig that we are indebted for the idea that they are derivatives of ammonia, or, in other words, amidogen bases or ammonia in which an equivalent of hydrogen is replaced by an organic radical. The subject has been thoroughly worked out by Dr. Hofmann, who originally proposed to classify these bodies under the heads of *amidogen, imidogen, nitrile,* and *ammonium* bases; but afterwards adopted the terms *primary amines, secondary amines,* and *tertiary amines,* in preference to amidogen, imidogen, and nitrile bases—the word *amines* being applied to all organic bases that are derived from ammonia (NH_3). The amines may be (1) *monamines,* (2) *diamines,* (3) *triamines,* (4) *tetramines,* or (5) *pentamines,* according as they contain single, double, treble, quadruple, or quintuple molecules of NH_3. We shall confine our illustrations of the meaning of these terms to the monamines, both because they form the most important group and because they are much more readily elucidated than the other groups, which are extremely complicated in their composition. *Monamines* are constructed upon the single molecule of ammonia, H_3N. In *primary monamines* one of the atoms of hydrogen is replaced by an organic radical, R; and hence their general formula is RH_2N. Ethylamine or ethylia $(C_2H_5)H_2N$, or C_2H_7N, is an example. In *secondary monamines* two of the atoms of hydrogen are replaced by two molecules of either the same or different radicals. Hence their general formula is RR′HN, where R and R′ may be the same or different radicals. Diethylia $(C_2H_5)_2HN$, or $C_4H_{11}N$, and methyl-ethyl-amine, or methyl-ethylia $(CH_3)(C_2H_5)HN$, or C_3H_9N, are examples. In *tertiary monamines* the three atoms of hydrogen are replaced by three molecules of the same or different radicals; their formula therefore is RR′R″N, when R, R′, R″ may or may not differ from one another. Trimethylamine or trimethylia $(CH_3)_3N$, or C_3H_9N, and methyl-ethyl-phenyl-amine or methyl-ethyl-phenylia $(CH_3)(C_2H_5)(C_6H_5)N$, or $C_9H_{13}N$, afford examples of the radicals being all the same and of their being all different. This last example affords a good illustration of the fact, that although the modern nomenclature of organic chemistry includes long and apparently complex words, these words to a great degree represent the composition of the substance they are used to indicate; methyl (CH_3), ethyl (C_2H_5), and phenyl (C_6H_5), mainly contributing to form methyl-ethyl-phenylia.

(2) Although all attempts at forming in the laboratory those alkaloids that naturally exist in plants, such as morphia, quinia, and strychnia, have hitherto failed, a large number of organic bases have been prepared by artificial means, such as: *a.* By the destructive distillation of organic bodies containing nitrogen. Thus, in the preparation of coal-gas, four at least of these compounds are obtained, viz., aniline, picoline, leukoline (or quinoline), and pyridine. *b.* By the distillation of certain nitrogenous compounds with caustic potash. In this way aniline is obtained from indigo. *c.* By the action of ammonia upon haloid ethers and upon ethers of inorganic acids. Thus methyl iodide and ammonia yields methylamine; also ethyl nitrate and ammonia yields ethylamine.

d. By reduction of nitro compounds with nascent hydrogen. In this way nitrobenzol is converted into phenylamine (aniline). *e.* By the processes of fermentation and putrefaction. Thus wheaten flour yields by putrefaction trimethylamine, ethylamine, and amylamine.

ORGANIC COMPOUNDS. It was formerly believed that the compounds to which the term *organic* is applied could only be produced by a vital force acting in a more or less complex animal or vegetable organism. It is, however, now known that this view is altogether untenable, and that many substances which are products of animal or vegetable organisms may also be formed artificially in the laboratory. Thus urea, the chief and most characteristic organic constituent of urine, may be formed by the direct union of chlorine and carbonic oxide (which form *phosgene gas*) with ammonia; and glycose or grape-sugar may be artificially produced from starch, woody fiber, paper, linen, etc. Although such cases as that of urea, in which a complex organic product, CH_4N_2O, is produced by the direct union of three inorganic substances (and many other cases of the same nature might be adduced), show that there is no definite line of demarkation between organic and inorganic products, it is useful, as a matter of convenience, to classify chemical compounds according to their natural origin.

The following are the leading characteristics of organic compounds: Those which occur naturally rarely consist of more than four elements—viz., carbon, hydrogen, nitrogen, and oxygen—although a few contain sulphur, and possibly (but this is doubtful) phosphorus. By artificial means, however, organic compounds can be formed containtaining chlorine, bromine, iodine, selenium, tellurium, and many of the metals. Carbon is universally present both in natural and artificial organic compounds. The number of equivalents entering into the composition of organic compounds is usually higher than in the case of inorganic compounds. Melissic acid, for example, one of the constituents of wax, is represented by $C_{30}H_{60}O_2$; that is to say, each equivalent of the acid is composed of 92 equivalents of the elements entering into its composition; and each equivalent of the solid fat, commonly known as stearine, contains 57 equivalents of carbon, 110 of hydrogen, and 6 of oxygen. No instance is known in which an organic compound has been formed by the direct union of its elements in a free state, as many sulphides, chlorides, and oxides (for example) are formed in inorganic chemistry. Their extreme readiness to decompose under the influence of heat, fermentation, putrefaction, etc., is another characteristic of organic compounds, although some artificially prepared inorganic compounds—as, for example, chloride of nitrogen—are also very unstable.

The following scheme may serve to elucidate the arrangement of the elements in organic compounds. Such compounds may be composed of carbon and oxygen, as carbonic oxide, CO; or of carbon and hydrogen, as oil of turpentine, $C_{10}H_{16}$; or of carbon and nitrogen, as cyanogen, C_2N_2; or of carbon, hydrogen, and oxygen, as grape-sugar, $C_6H_{12}O_6$; or of carbon, nitrogen, and oxygen, as trinitro-acetonitril, $C_2N_4O_6$; or of carbon, hydrogen, and nitrogen, as nicotine, $C_{10}H_{14}N_2$; or of carbon, hydrogen, and sulphur, as oil of garlic, $(C_3H_5)_2S$; or of carbon, hydrogen, nitrogen, and oxygen, as caffeine, $C_8H_{10}N_4O_2$; or of carbon, hydrogen, nitrogen, and sulphur, as oil of mustard, $C_3H_5 \cdot NCS$; or finally, of carbon, hydrogen, nitrogen, oxygen, and sulphur, as taurine, $C_2H_7NSO_3$. Hence organic compounds may be binary, ternary, quaternary, or quinary in their composition.

ORGANIC RADICALS. Under the term organic or compound radicals (or radicles, as some chemists write the word) are included a number of groups of elements, of which carbon is always one, which comport themselves chemically like simple elementary bodies. The careful study of organic compounds led chemists to perceive that many of these contained as a proximate constituent a more or less complex atomatic group, which in its combining relations behaves precisely like the elementary substances, and which, like them, may be transferred from one compound to another; and hence the inference was drawn, that all organic compounds were combinations of organic radicals with oxygen, sulphur, hydrogen, or other elements, or of one organic radical with another. In accordance with this view, Liebig defined organic chemistry as *the chemistry of organic radicals.* In order to show how much the theory of organic radicals serves to elucidate the composition of organic compounds, and to reduce the laws of organic to those of inorganic chemistry, we will point out some of the chemical analogies between the radical *ethyl*, C_2H_5, the metal potassium, K, the radical *cyanogen*, CN, and the halogen chlorine, Cl.

Type — Water = HOH.

KOH	= Potassium hydrate.	$C_2H_5 \cdot OH$	= Ethyl hydrate or alcohol.
K_2O	= Potassium oxide.	$(C_2H_5)_2O$	= Ethyl oxide or ether.
KSH	= Potassium sulphydrate.	C_2H_5SH	= Ethyl sulphydrate or mercaptan.
K_2S	= Potassium sulphide.	$(C_2H_5)_2S$	= Ethyl sulphide.
KNO_3	= Potassium nitrate.	$C_2H_5NO_3$	= Ethyl nitrate.
K_2SO_4	= Potassium sulphate.	$(C_2H_5)_2SO_4$	= Ethyl sulphate.

Type — Hydrochloric acid = HCl.

KCl	= Potassium chloride.	$C_2H_5 \cdot Cl$	= Ethyl chloride.
KCl	= " "	$CN \cdot Cl$	= Cyanogen chloride.
HCl	= Hydrochloric acid.	HCN	= Hydrocyanic acid.
KCl	= Potassium chloride.	KCN	= Potassium cyanide.
KCl	= " "	$C_2H_5 \cdot CN$	= Ethyl cyanide.

Type — Ammonia = NH_3.

NH_3	= Ammonia.	$C_2H_5 \cdot NH_2$	= Ethylamine.
NH_3	= "	$(C_2H_5)_2 : NH$	= Diethylamine.
NH_3	= "	$(C_2H_5)_3 : N$	= Triethylamine.
NH_4Cl	= Ammonium chloride.	$(C_2H_5)_4NCl$	= Tetra ethyl ammonium chloride.

Again, if under certain conditions chloride of ethyl is brought into contact with potassium hydrate, the reaction expressed in the following equation occurs :

Ethyl Chloride. Potassium Hydrate. Ethyl Alcohol. Potassium Chloride.

$$C_2H_5Cl + KOH = C_2H_5 \cdot OH + KCl$$

which shows that the ethyl and the potassium may mutually replace one another in compounds ; and the same might be similarly shown of cyanogen and chlorine.

Comparatively few organic radicals have been obtained in an isolated state ; and in most cases the existence of any special radical is only inferred from the fact that the group of atoms of which it is supposed to be composed can be transferred from one elementary substance to another, and can be made to enter into combination with other organic radicals. The existence of ethyl was thus inferred long before the substance itself was isolated, and the radical benzoyl, C_7H_5O (symbol Bz), which exists in the oil of bitter almonds, and on which Liebig specially bases his whole theory of organic radicals, has never been isolated. The simplicity obtained by adopting the radical theory in place of using merely empirical formulas is well shown in the two contrasted modes of symbolically representing the compounds which are obtained from this oil :

Empirical Formula.	Rational Formula (Benzoyl = $C_6H_5 \cdot CO \cdot$).	
Oil of bitter almonds, C_7H_6O	= $C_6H_5 \cdot CO \cdot H$	Benzoyl hydride.
Benzoic acid, $C_7H_6O_2$	= $C_6H_5 \cdot CO \cdot OH$	Benzoyl hydrate.
Chlorine-compound, C_7H_5OCl	= $C_6H_5 \cdot COCl$	Benzoyl chloride.
Sulphur-compound, $C_{14}H_{10}O_2S$	= $(C_6H_5CO)_2S$	Benzoyl sulphide.
Cyanogen-compound, C_8H_5NO	= $C_6H_5 \cdot CO \cdot CN$	Benzoyl cyanide.

The organic radicals are either binary or ternary in their composition. Many of them —as, for exampie, ethyl—consist of carbon and hydrogen ; others, as carbonyl (or carbonic oxide), of carbon and oxygen ; others, as cyanogen, of carbon and nitrogen ; and others again, like benzoyl, of carbon, hydrogen, and oxygen. Into a few radicals a metallic element enters ; these are termed organo-metallic radicals ; and cacodyl, a radical which contains arsenic, and represented by the formula $As(CH_3)_2$, is the best example of this class. All recent works on organic chemistry are based either on the theory of organic radicals or on the more complicated theory of types, which will be noticed in a special article.

ORGANI'STA, the common name of a number of small South American birds, allied to wrens, and remarkable for the sweetness of their song. The Peruvian organista (*troglodytes leucophrys* of Tschudi) has a modest, cinnamon-brown plumage, with head and neck of dark olive. "The tender, melancholy strains, and the singular clearness of the innumerable modulations, charm the ear of the astonished traveler, who, as if arrested by an invisible power, stops to listen."—Tschudi's *Travels.*

ORGANO-LYRICON, a musical instrument consisting of a piano-forte combined with twelve kinds of wind instruments—flutes, bassoon, horns, trumpet, and fife. It was invented in Paris by M. de Saint Pern in 1870, and was the first of a number of similar inventions, such as the orchestrion. There were two rows of finger-keys which were so arranged as to act independently or together, or with a partial effect. Pedals at the foot of the instrument called into play various tones, and the bellows was worked by clock wheels and weights.

ORGANO-METALLIC BODIES. Under this term are included a large number of chemical compounds in which organic radicals, such as methyl, CH_3, ethyl, C_2H_5, etc., are united to metals in the same way as chlorine is combined with zinc, forming chloride of zinc. If, for instance, in chloride of zinc, $ZnCl_2$, we replace the chlorine by ethyl, we produce one of the bodies belonging to this class, viz., zinc-ethyl, $Zn(C_2H_5)_2$. This substance (which we take as a good example of the class) is obtained by digesting a mixture of equal volumes of iodide of ethyl and ether with granulated zinc, at a temperature of about 260° F., for several hours. Subsequent distillation gives a mixture of zinc-ethyl and ether, from which the former may be obtained pure by rectification, in the form of a colorless, transparent, mobile liquid, which refracts light strongly, has a powerful but not disagreeable odor, and is rather heavier than water, its specific gravity being 1.182 at 64° F. With the exception of cacodyl, $As(CH_3)_2$, these bodies are the creation of the last ten or twelve years, during which period numerous compounds of

organic radicals with zinc, cadmium, magnesium, antimony, arsenic, bismuth, mercury, lead, sodium, and potassium have been discovered.

ORGAN-POINT, or PEDAL-POINT, in music, a bass note sustained through a series of chords, with only the first and last of which it is in harmony. The sustained note may be the dominant or tonic, and sometimes occupies an upper part instead of the bass.

ORGAN'ZINE, a name applied to silk which after having been first wound off from the cocoons into hanks is then placed on a winding machine, which reels off the hanks on to wooden reels. These are then placed on spindles, and the fibers of each are made to pass through a minute orifice and small brush, which together clean the thread and remove any knots or projections from it, throwing it at the same time into hanks again. Then the threads of two hanks are taken and again reeled off, this time on to one hank, being twisted together *to the left;* then two of these doubled reels are taken, and the ends being laid together, are twisted *to the right.* These operations, consisting of winding, cleaning, throwing, and twice twisting and doubling, constitute organzine silk. See SILK.

ORG'EAT, a kind of culinary preparation, which is both used as an agreeable syrup to mix in certain drinks, or medicinally as a mild demulcent. It is prepared by making an emulsion of almonds, which are blanched for the purpose, and beaten into a paste in a mortar, and then rubbed up with barley-water. The proportions are: 1 lb. of sweet and 1 oz. of bitter almonds to a quart of barley-water. To this emulsion are added 2 lbs. of powdered loaf-sugar, and a quarter of a pint of orange-flower water. There are other modes of making it, but this is the simplest and best. It is much used in France under the name of *sirop d'orgeat.*

ORGIES (probably from Gr. *erdo,* in the perfect, *eorga,* to sacrifice), or MYSTERIES, secret rites or customs connected with the worship of some of the pagan deities; as the secret worship of Ceres (q.v.), and the festival of Bacchus, which was accompanied with mystical customs and drunken revelry. The name is now applied to scenes of drunkenness and debauchery.

ORGUINETTE. This instrument, in its present form, was developed from the inventions of Seytre, of France (1842), who is acknowledged to be the pioneer in the preparation of music on slotted paper; and Alexander Bain, of Scotland (1847), who obtained a patent for his own application of a sheet of slotted paper, or any flexible material, which acted as a moving valve. In 1848 Charles Dawson, of England, further experimented upon a music sheet similar to those of Seytre and Bain, but with a different arrangement of the air-chest and pipes. A further improvement was made by Pape, of France, in 1851, and also by Fourneaux (1863). In 1867 George Vanduzen used a slotted belt, but it was not until 1877, after the Centennial Exhibition, which seems to have given it an impetus, that Mason J. Mathews adjusted all difficulties; and E. P. Needham, who had also patented an instrument of this kind, and Newman R. Marsh commenced to manufacture orguinettes. They immediately sprang into popularity, and are now extensively used by those untrained in technicalities. The internal mechanism of the orguinette consists of a music-chest, bellows, slotted sheet, and rollers. These are enclosed in a box, with a lid, on the principle of that used to give the ordinary organ swell, controlled by the left hand of the operator. The sheet of paper, which passes over the roller by means of a crank turned by the right hand, is perforated thickly with slots, varying from nearly three-eighths of an inch square to three-eighths of an inch wide, by two, three, or four inches in length. The length of the tone depends entirely upon the size of these slots and models the tune. Just underneath this paper is the reed-chest, with openings to correspond with those on the paper. As the handle or crank is turned, the paper slips along, and each aperture in the sheet passes over its own reed in the sound-chest. As it does so the bellows exhausts the air in the reed, and the musical sound or note is given.

O'RIEL COLLEGE. In 1324 Adam de Brom, almoner of Edward II., procured from the sovereign a charter of incorporation for a college, under the name of St. Mary's house, in Oxford. The origin of the name "Oriel college" is uncertain. It consisted originally of a provost and 10 fellows. The number of fellows was by subsequent benefactions raised to 18, and several exhibitions and scholarships were also founded at various times. By the commissioners under 17 and 18 Vict. c. 81, all the fellowships are thrown open, but two are in the mean time suspended for the purpose of increasing the number and value of the scholarships, and of augmenting the salary of the professor of modern history. By the same authority the scholars are placed on the foundation of the college, a position they did not before enjoy; the scholarships are made ten in number, tenable for five years, of value £80 per annum, with rooms free. This college was one of the first to throw open such of its fellowships as it could to competition, and hence the fellows of Oriel have long been among the most distinguished men in the university.

ORIEL WINDOW, a projecting window having more sides than one, usually three, and commonly divided into bays by mullions. It is one of the most picturesque features in mediæval and Elizabethan domestic architecture, and adds much to the convenience of the interior. The word oriel (Med. Lat. *oriolum,* probably dim. from *os, oris,* as if a small opening or recess) formerly meant a chamber or apartment, and a window is so

called which makes a small apartment, as it were, off a large room. Oriels are also called bay or bow windows (q.v.).

ORIENT, The Three Kings of. See Kings of Orient.

ORIENTA'TION. As Christians from an early period turned their faces eastward when praying, so Christian churches for the most part were placed e. and w., in order that the worshipers, as they looked towards the altar, might also look towards the east. Modern observation, however, has found that few churches stand exactly e. and w., the great majority inclining a little either to the n. or to the south. Thus, of three ancient churches in Edinburgh, it was ascertained that one (St. Margaret's chapel in the castle) pointed e.s.e.; another (St. Giles's cathedral), e.-by-s.½s.; a third (Trinity college church, now destroyed), e.½s. This deviation from the true e. has received, among English ecclesiologists, the name of "orientation." Its origin or cause has not been satisfactorily explained. Some have supposed that the church was turned not to the true e., but to the point at which the sun rose on the morning of the feast of the patron saint. But, unfortunately for this theory, neighboring churches, dedicated in honor of the same saint, have different orientations. Thus, All Saints' at West Beckham, in Norfolk, points due e.; while All Saints' at Thwaite, also in Norfolk, is 8° to the n. of east. There are instances, too, in which different parts of the same church have different orientations; that is to say, the chancel and the nave have not been built in exactly the same line. This is the case in York minster and in Lichfield cathedral. Another theory is, that orientation "mystically represents the bowing of our Savior's head in death, which Catholic tradition asserts to have been to the right [or n.] side." But this theory is gainsaid by the fact, that the orientation is as often to the s. as to the north. Until some better explanation is offered, it may, perhaps, be allowed to hold, that orientation has had no graver origin than carelessness, ignorance, or indifference.

ORIFLAMME, or Auriflamme (Lat. *auri flamma*, flame of gold), a banner which originally belonged to the abbey of St. Denis, and was borne by the counts of Vexin, patrons of that church, but which, after the county of Vexin fell into the hands of the French crown, became the principal banner of the kingdom. It was charged with a saltire wavy or, with rays issuing from the center crossways. In later times the oriflamme became the insignia of the French infantry. The name seems also to have been given to other flags; according to sir N. H. Nicolas, the oriflamme borne at Agincourt was an oblong red flag split into five parts.

ORI'GENES (Origen), called *adamantinos* or *chalchentezos*—both epithets expressive of his firmness of purpose and iron assiduity—one of the most eminent of the early Christian writers, "the father of biblical criticism and exegesis in Christendom," was b. 185 A.D., at Alexandria, where his father, Leonidas, seems to have held some superior office in the church. Origenes received a most liberal education. While, on the one hand, he was initiated at an early age into Hellenic science and art, the teachings of Christianity were instilled into his mind by men like Pantænus and Clemens of Alexandria. During the persecutions against the Christians, instituted by Sept. Severus, his father died the death of a martyr, and Origenes, then 17 years of age, would have shared it of his own free will had not his mother, left unsupported with six children, prevented him. After a short time his zeal and erudition procured for him the office of catechist in the Alexandrian church; but no salary being affixed to it, he was fain to dispose of his much-loved collection of classical authors for a daily stipend of four oboli (2d.) for several years. His wants were extremely limited, and his asceticism led him even to self-mutilation (in accordance with the view he took of Matt. xix. 12): an act for which he afterwards expressed the deepest sorrow, and which became a dangerous weapon in the hands of his antagonists. Not a few of his hearers being masters of Greek (Neoplatonic) philosophy, Origenes, in order to ward off more successfully their attacks upon his doctrines, and to combat them on their own ground, applied himself particularly to this science, and Ammonius Saccas himself is said to have been his teacher. From this period also may be dated Origenes's transition from unconscious to conscious belief. He examined henceforth, with as little prejudice as possible, all the different systems of human speculations that came under his notice during the many journeys he undertook, proceeding on the principle "that we are not, under the pretense of piety, to pin our faith on that which is held by the multitude, and which therefore alone seems to stand on high authority, but on that which results through examination and logical conclusions from established and admitted truths." This liberality of his mind and doctrines could not fail, on the one hand, to bring about many conversions to the faith, as he taught it, both among "pagans" and "heretics," the latter chiefly of the gnostic sects; and on the other hand, to raise an outcry among less liberal professors and teachers of the faith, who had not been so successful in their labors. What gave the greatest offense in his teachings was his way of explaining, after the manner of the Midrash, known to him through the Jewish masters (from whom, at an advanced age, he had also learnt Hebrew) allegorically and symbolically that which in the Scripture warred with the common human understanding, or seemed repugnant in manner or matter. Furthermore, while upholding all the ethical portions of the Bible, he rejected a great deal of its supposed historical and legal contents for all purposes, save, perhaps, as starting-points for homiletics. "What edification," he says, "could we find in literally interpreting the story of Abraham's first telling Abimelech a lie, and then, with Sarah's consent, handing her

over to him and prostituting her?" As to the discrepancies in the different gospels respecting the life of Christ, he says: "One of two only is possible. Either these things are true in a *spiritual* sense only, or as long as the discrepancies are not satisfactorily explained away, we cannot believe in the gospels being dictated by the Holy Ghost, and redacted under the influence of his inspiration."

In 211 he went to Rome, but soon afterward, at the wish of bishop Demetrius, he returned to Alexandria, which, however, he was obliged to leave precipitately, and to seek refuge from certain popular tumults in Palestine. Here the bishops received him with great honors, and desired him to institute public lectures, in which they themselves became hearers. Recalled again by the Alexandrian bishop, he was sent to Achaia to combat certain heresies that had broken out there. The wrath that had silently been gathering against him found its first vent when, in 228, the bishops assembled in Cæsarea in Palestine consecrated him presbyter. The bishop of Alexandria took umbrage at this outrage, as he called it, on his authority. Two councils were convoked, and in 231, Origenes was deprived of his priestly office, and excommunicated, the principal heresy charged against him being his denial of eternal punishment. Yet the churches of the east remained faithful to him. Palestine, Arabia, Phenicia, and Achaia remained in constant communication with him; and men like Gregory Thaumaturgus (q.v.), Athenodoros, and others remained or became his faithful disciples ever after, while the bishop of Cæsarea allowed him openly to expound the Scripture in his church. The persecutions under Maximinus again forced him to seek refuge for two years in Cappadocia. Returning under Gordianus, he resumed his labors and journeys, until, when Decius ascended the throne, he was seized, imprisoned, and tortured for his faith. He did not survive his sufferings long, but died, in 254, at Tyre, where his tomb, near the high-altar of the cathedral, was shown for many centuries, until it was destroyed during the Crusades.

The number of his works is stated by Epiphanius and Rufinus to have exceeded 6,000, and although this is probably only meant as an exaggerated round number, yet the amount of writings that issued from his always busy brain and hands cannot but have been enormous. Seven secretaries and seven copyists, aided by an uncertain number of young girls, are by Eusebius reported to have been always at work for him. The great bulk of his works is lost; but among those that have survived, the most important by far are his two editions of the Old Testament, called respectively *Tetrapla* (*four*fold) and *Hexapla* (*six*fold). See HEXAPLA. The labor bestowed upon this work must have been immense, and no less than twenty-eight years is Origenes supposed to have been engaged upon it. On its importance for Biblical criticism it is needless to enlarge here. Fragments only have come down to us, the original having been lost during the siege and capture of Cæsarea by the Arabs; and the Greek as well as the Roman clergy having almost laid an interdict upon the copying of any of Origenes's much suspected writings. Montfaucon has collected and edited these fragments (*Hexaplorum Origenis quæ supersunt*, 2 vols. fol. Paris, 1714), which were re-edited by C. F. Bahrdt (1769–70). Of his other partly extant, partly lost works, the chief are his books "On the Resurrection," "On Martyrdom," "Eight Books against Celsus," "On Prayer," besides Epistles, etc. He further revised and enlarged Philo's Lexicon of Hebrew Names (*Hebraicorum Nominum S. Scripturæ et Mensurarum Interpretatio*), whence it has often, together with many other spurious works, been ascribed to him exclusively. Little also has survived of his many exegetical writings, commentaries, brief notes, and homilies on both Testaments. The best editions of his collected works are by De la Rue (Rudens), (Paris, 1733–59, 4 vols. fol.); by Oberthür (Wurzburg, 1785–94, 15 vols.); and by Lommatzsch, which is critical and more complete (Berlin, 1831), etc.

ORIGINAL SIN. According to this theological tenet, when stated in its extremest form, men come into the world with the reason and will utterly corrupt. This corruption originated in the fall of Adam, and has been inherited equally by all his posterity, so that the natural man is not only incapable of knowing and loving God and goodness, but is inclined to contemn God and pursue evil; on which account the anger of God has subjected him to temporal death, and destined him to everlasting punishment in hell. The doctrine is founded on the account of the fall given in Genesis, and on some passages in Paul's epistle to the Galatians, and in that to the Romans; which passages, however, are held by others to contain no such doctrine; and indeed nearly every point in the history of the doctrine is the subject of as much controversy as the details of the doctrine itself. The early church, it is maintained by one school, was unacquainted with it; and the most orthodox admit that the doctrine had not at that time been fully developed. The Christian fathers; Justin Martyr, Clemens Alexandrinus, Irenæus, and others, ascribe to the natural man a certain ability to know God and choose the good, they are said to reject distinctly all propagation of sin and guilt, and even to refer human mortality not to Adam's sin, but solely to the constitution of the body. Origen, on the other hand, in opposition to the Gnostics and Manichees, who grounded the sinfulness of men on the connection of the soul with a material body, asserted that the sinfulness was in existence at birth, but ascribed the development of actual sins and their consequences not to propagation, but to the moral operation of precept and example. He accordingly found the cause of sin to be in the freedom of the will, the abuse of

which he explained partly by the operation of evil powers, partly by the predominance of the sensuous part of man's nature over the rational mind. The orthodox teachers of the Greek church, again, held that Adam, by the fall, rendered himself and all his posterity mortal, but, according to the less rigid schools, they looked for the origin of sin in the freedom of the will acted upon by the flesh, and by demoniacal influences, and ascribed to man the power of resisting every evil if he chose. These views, it is alleged, continued to be held, in substance, by the Christian teachers in the east, and were fully developed by Chrysostom; but Catholic writers maintain that in all this Chrysostom and the other Greek fathers are speaking not of the *natural* powers of the will, but of the will as assisted by divine grace.

The doctrine took another shape in the Latin church. Tertullian, following up his dogma of Traducianism, according to which the child derives not only its body but its soul from its parents, maintained that sinfulness had been propagated, along with mortality, from Adam to all mankind; he thus defended an *originis vitium*, without conceiving it as actual sin and denying all capacity for good in man. This view was followed by Cyprian, Ambrose, and even by Augustine in his earlier writings. It was only during his controversy with Pelagius and Cælestius that Augustine developed the doctrine into the full form given above. His great influence in the western churches procured the condemnation of his opponents, the Pelagians (see PELAGIANISM ; PELAGIUS) as heretics at the councils of Carthage (412, 416, 418), although the councils of Jerusalem and Diospolis (415) decided in their favor. Building upon the foundation of Traducianism, Augustine laid down that every natural man is in the power of the devil, and upheld the justice of this as a punishment for the share which the individual had in Adam's transgression; for as all men existed in the loins of Adam, all sinned with him. Pelagius, on the other hand, who rejected the Traducian theory, denied that sin is propagated physically, or that the fall of Adam has exercised any prejudicial influence on the moral constitution of the posterity; and maintained that all men are born in a state of innocence, possess the power of free-will, and may therefore live without sin. He and his followers objected to Augustine, that his doctrine was in direct contradiction to clear passages of Scripture, and that it made God the originator of evil and an unrighteous judge.

Great as was the respect for Augustine, the harshness of his doctrine was too shocking to the natural sentiments to meet with lasting acceptance. In the eastern church it never gained a footing, and even in the west it met with opposition. In Gaul, John Cassian, Faustus, Arnobius, and others, took up a view midway between the views of Augustine and Pelagius, from which they were called Semipelagians. They attributed to man a capacity for good which makes it possible for him, not indeed to merit the favor of God, but to make himself capable of receiving it; and maintained that it is only a certain inborn weakness that men inherit from the first pair. The Semipelagian doctrine found acceptance especially among the monks (in particular among the Franciscans), continued to prevail during the middle ages, and among the scholastics found partisans in the Scotists. Augustine's views also found advocates among the scholastic philosophers, who, however, added to it many limitations and explanations. Regarding the way in which original sin is propagated, many held by the Traducian theory, while others conceived it to be a sort of infection of the soul by the defiled body, or an imputation of guilt to all partakers of the human nature. Petrus Lombardus adhered to Augustine. Anselm of Canterbury conceived original sin to be a want of requisite righteousness, and thought that this want was imputed to all the posterity of Adam, although not in the same degree as if they had themselves sinned. Anselm's view was adopted by Duns Scotus, while Bonaventura and Thomas Aquinas sought to combine the opinions of Anselm and Augustine. Anselm had thought that his theory afforded a better explanation of the sinless birth of Christ; and about the 12th c. it began to be maintained that Mary also was conceived without sin.

The reformers of the 16th c. everywhere made original sin a leading doctrine, and thus were enabled to combat effectively the Roman Catholic doctrine of the merit of works; while the Catholic church, in the fifth session of the council of Trent, stamped what the Calvinist school would call Semipelagianism as the orthodox doctrine. The reformed churches agreed with the Lutheran on the point of original sin. In this they followed Calvin rather than Zwingli, who looked upon it as an evil or disease, and as becoming sin only when a commandment is transgressed. The Arminians and Socinians, on the other hand, denied the doctrine of hereditary sin in the ecclesiastical sense. The Mennonities spoke of a loss of the divine image in consequence of the fall of Adam, but still asserted the free-will of man. The Quakers rejected the name of original sin altogether; they held that there is a germ of sin in man, from which imputable sin springs, and that, however corrupt, he has still the susceptibility of being awakened to the inward light. The whole Protestant church held, besides, that Jesus alone was free from sin, both original and actual. The Roman Catholic church ascribed this attribute also to Mary, though no public and distinct declaration on the point was given by the council of Trent. See IMMACULATE CONCEPTION.

The harshness of the Augustinian dogma led, at the time of the reformation, to keen controversies; Erasmus disputed the point with Luther, and would only admit a weakness of the free-will arising from original sin, and by no means a complete annihilation

of it. From that time the doctrine in Germany continued to be variously attacked and defended. It has been discussed by the schools of philosophy. Kant showed the moral signification of the dogma, and made out original sin to be a propensity to evil inherent in man. The Schelling-Hegel school, again, explained it as the finite nature with which the individual is born. In recent times, the theologians of the old Lutheran and strictly orthodox tendencies, such as Olshausen, Tholuck, Hengstenberg, and others, have come forward as adherents and defenders of the Augustinian doctrine; while the more liberal theologians modify it in various ways, not admitting any moral inborn corruption arising from the fall, but only a weakness in man's nature for the knowledge and performance of good. How far, and with what differences, the extreme Augustinian view is held by the churches of England and Scotland, will be seen from the following extracts from the *Thirty-nine Articles* and the *Westminster Confession of Faith.*

From Art. ix. of the *Thirty-nine Articles:* "Original sin standeth not in the following of Adam (as the Pelagians do vainly talk); but it is the fault and corruption of the nature of every man, that naturally is engendered of the offspring of Adam, *whereby man is very far gone from original righteousness,* and is of his own nature inclined to evil, so that the flesh lusteth always contrary to the spirit; and therefore in every person born into the world, it deserveth God's wrath and damnation."

From chap. vi. of the *Westminster Confession:* "By this sin" (i. e., the eating of the forbidden fruit), "they" (i. e., our first parents) "fell from their original righteousness and communion with God, and so *became dead in sin, and wholly defiled in all the faculties and parts of soul and body.* They being the root of all mankind, the guilt of this sin was imputed, and the same death in sin and corrupted nature conveyed to all their posterity, descending from them by ordinary generation. From this original corruption, *whereby we are utterly indisposed, disabled, and made opposite to all good, and wholly inclined to all evil,* do proceed all actual transgressions.

ORIHUE'LA, an ancient t. of Spain in the modern province of Alicante, and 12 m. n.n.e. of Murcia, stands on the banks of the Segura, in a plain remarkable alike for its beauty and its fertility. It is long and straggling, while its palm-trees, square towers, and domes give it an oriental appearance. It contains a cathedral, numerous churches and convents, barracks, etc. The manufactures are linen goods and hats, and many corn and oil mills and tanneries are in operation. Olive oil is very extensively made. The vegetation here is gigantic; the oleanders are actual trees. Orihuela has been possessed by Carthaginians, Romans, Moors, and Spaniards in turn. Pop. comm. 24,400.

ORI'LLON, in fortification, and especially in the earlier systems, is a semicircular projection at the shoulder of a bastion, intended to cover from the observation of the enemy the guns and defenders on the flank, which, with such a construction, is somewhat retired or thrown back. The flank thus protected is held by many distinguished engineers to be most valuable in the defense of the ditch, in clearing it from an attacking party, or from hostile miners. The retired flank is sometimes straight, at others curved. The orillon is as old as the bastion, and is found in the works of Pagan and Speckle.

ORINO'CO, a great river of South America, flows through Guiana and Venezuela, and reaches the Atlantic ocean s. of Trinidad, in lat. 8° 40′ north. The country in which it takes its rise is inhabited by an aboriginal race called the Guaicas, who have hitherto prevented all access by foreigners to its sources; but it is known to rise in the Sierra Parima, one of the chief mountain chains of Guiana, near lat. 2° 30′ n., long. 64° 25′ west. It has been explored by Humboldt to the village of Esmeraldas (lat. 3° 8′ n., long, 66° 5′ w.), and by Schomburgk to within 30 m. of its source. After flowing w.s.w. 20 m. past Esmeraldas the river bifurcates, and the southern branch, the Cassiquiari (q.v.), flowing s.w., joins the Rio Negro, an affluent of the Amazon. From this point the Orinoco flows n.w. to its junction with the Guaviare, then n.n.e. to its junction with the Apure, after which it flows in an eastward direction to its mouth. Length of course 1550 miles. The head of uninterrupted navigation is at the confluence of the Orinoco, with the Apure, 777 m. from the mouth of the river. Above this point the course of the river is interrupted by "raudals" or cataracts, of which those of Maypures and Atures are the most celebrated. Its principal affluents from the left are the Guaviare, the Vichada, the Meta, and the Apure; from the right, the Ventuare, Caura, and Caroni. The Orinoco, which is joined by 436 rivers, and upwards of 2,000 streams, drains an area (usually stated at 250,000 sq. m.) which, according to Wappäu's *Republiken von Süd-Amerika,* may be estimated at 650,000 sq. miles. It begins to form its delta 130 m. from its mouth, by throwing off a branch which flows northward into the Atlantic. Several of the mouths are navigable, and the main stream, the Boca de Navios, is divided by a line of islands into two channels, each two m. in width. Bolivar, a town upwards of 250 m. from the mouth of the river, marks the head of tide-water, and here the river is 4 m. wide and 390 ft. deep. Below the junction of the Apure the character of the scenery seems to be uniform—forests on the right bank, and llanos on the left.

O'RIOLE (*Oriolus*), a genus of birds of the Thrush family (*Merulidæ* or *Turdidæ*) having an elongated conical beak, broad at the base; the upper mandible ridged above, and notched at the point; wings of moderate size, the first feather very short, the third the

longest; the tail of moderate length, and rounded; the tarsus not longer than the middle toe; the outer toe joined at its base to the middle toe; claws strong and curved. The species are numerous, all natives of the Old World, and chiefly of the warmer parts of it; the adult males generally of much brighter plumage than the females and young males, the prevalent color yellow. Only one species is found in Europe, the GOLDEN ORIOLE (*Oriolus galbula*), pretty common in Italy and some other parts of Europe, but a rare summer visitant of England, and never seen in Scotland, although it occasionally breeds in the south of Sweden.—The name Oriole is still very commonly given to the Baltimore bird (q.v.) and other American birds of the Starling family, the chief resemblance of which to the true orioles is in color. See illus., BIRDS, vol. II.

ORI'ON, in Greek mythology, was a gigantic hunter, and reputed the handsomest man in the world. His parentage is differently given. According to the commonly received myth, he was the son of Hyrieus of Hyria, in Bœotia, and was called in his own country Kandaon. Another account makes him a son of Poseidon and Euryale, while some state that he was *Autochthonos,* or "earth-born." So immense was his size, that when he waded through the deepest seas he was still a head and shoulders above the water; and when he walked on dry land, his stature reached the clouds. Once on a time he came to Chios, in the Ægean sea, where he fell in love with Æro or Merope, daughter of Œnopion. He cleared the isle of wild beasts, and brought their skins as presents to his sweetheart; but her father always put off their marriage; whereupon Orion, one day giving way to passion (when under the influence of wine), sought to take the maiden by force. Œnopion now called upon Dionysus (Bacchus) for help, who put out the eyes of the inebriate lover. Orion, however, recovered his sight in Lemnos, by following the advice of an oracle, and returned to Chios to take vengeance on Œnopion. Not finding him, he went to Crete, where he spent the rest of his life hunting in company with Artemis (Diana). The cause and manner of his death are differently related. Artemis, say some, slew him with an arrow, because Eos, inflamed by his beauty, had carried him off to Ortygia, and thereby offended the gods. Others aver that Artemis, virgin-goddess though she was, cherished an affection for him, that made her brother Apollo fiercely indignant. One day, pointing out to her at sea a black object floating in the water, he told her that he did not believe she could hit it. Artemis, not recognizing her favorite, drew her bow, and pierced him through the head; a third myth makes him find his death from the sting of a scorpion. Asklepios (Æsculapius) wished to restore him to life, but was slain by a bolt of Zeus. After his death, Orion was placed with his hound among the stars, where the most splendid constellation in the heavens bears his name.

ORIS'SA, an ancient kingdom of Hindustan, the authentic history of which goes back to 473 A.D., extended from Bengal—a part of which it included—on the n., to the banks of the Godavari on the s., and from the coast on the e. to the river Gondwana on the west. From its remains of sculptures, inscriptions, etc., we may infer that its early civilization was high. The temple of the sun at Kanárek—erected about the 12th c.—exhibits carvings representing the planets, sculptured figures of animals, etc., which show that at that date the plastic and mechanical arts were in a more advanced state in Orissa than they were in England. It maintained its position as an independent monarchy till 1558, when, its royal line having become extinct, it became an outlying province of the empire of the great mogul. On the breaking up of this empire, the more valuable portions of Orissa were seized by the nizam of Hydrabad. The French, who had taken possession of a part of the country long known as the northern Circars, attempted to drive the English (who had also formed commercial settlements on the coast), out of India. The result of the contest for supremacy in India between the English and French is well known. The Mahrattas, who had seized a portion of Orissa in 1740, were forced to surrender it to the English in 1803. The soldiers of the East India company were marched into Orissa at the commencement of the present century, and an engagement was subsequently entered into between the company and the native chiefs and princes, by which the former bound themselves to perform certain services for the country (as maintaining the river-banks in good repair), while the latter engaged to pay a yearly tribute. Of the many principalities into which Orissa was divided, a large number got into arrears with the government, and the result was that numbers of the estates were sold, and the government, as a rule, became the purchaser. Much of the territory originally forming a portion of this kingdom thus fell into the hands of the British. The ancient Orissa, which existed as an independent monarchy for four centuries, and flourished as a principality of the mogul empire after 1558, is now hardly to be recognized in the British commissionership of Orissa, with an area of 9853 sq. m., and a pop. of ('91) 4,047,352. This country was decimated by famine in 1868–69; and careful surveys of its coast were made in 1870. Orissa is traversed by a branch of the eastern Ghauts running parallel with the coast. The hill-districts, which nowhere present an elevation of more than 3,000 ft., are inhabited by the Gonds, the Koles, the Sourahs, and the Khonds. The Khonds occupied an area extending from n. of the Mahanaddi, s. to the banks of the Godavari. Their mountain-haunts are admirably suited for defense, as the districts which they inhabit are almost inaccessible; and although they do not yet appear to have adopted firearms, they manage their battle-axes and bows and arrows with an adroitness

and courage that make them formidable enemies. The Khonds are a totally distinct race from the inhabitants of the plains, and there is but little resemblance between them and the other hill-tribes, the Gonds and Sourahs. The chief peculiarities of the Khonds are, that their language, which is quite distinct from those of the neighboring tribes, is not in the least understood by the inhabitants of the plains; and that human sacrifice formed, till within the last few years, one of the distinguishing features of their religion. They do not barter or traffic, and all commercial transactions are managed for the Khonds by the Panus, Doms, etc., regarded by their employers as inferior races. There are, however, no caste prejudices among the Khonds such as generally prevail throughout the plains of India. Agriculture and war are the only employments. The revolting custom of human sacrifice prevailed among the Khonds from the earliest times, although it was not till 1836 that the attention of the government was specially called to the subject, at the conclusion of an insurrection, in the course of which British officers had been brought into contact with the hill tribes. The Khond victims, called Meriah, were always bought with a price, sometimes from families of their own tribes who had fallen into poverty, but generally kidnapped from the plains by miscreants of the Panu race. The Meriah victims were of both sexes, and of every age; though adults were held in the highest esteem, because, being the most costly, they were supposed to be more acceptable to the deity. The object of the sacrifice was to propitiate the earth-god; and abundant crops, security from calamity, and general prosperity were supposed to be insured to any one who had cut off a portion of the flesh of the human victim, and buried it in his farm.

The consummation of the Meriah sacrifice was often attended with circumstances of the most revolting and disgusting cruelty. In some cases the event was preceded by a month's feasting, intoxication, and dancing round the Meriah. On the day before the sacrifice, the priest thus addressed the victim: "We have bought you with a price, and did not seize you; now we sacrifice you according to custom, and no sin rests with us." On the following day the victim was made senseless from intoxication, and then suffocated; after which the officiating priest cut a portion of the flesh from the body, and buried it as an offering to the earth-god. The people, following his example, hewed the flesh from the bones, and carried the bloody trophy to their distant villages, where it was buried. In many cases the victim was not intoxicated before sacrifice; but the joints of his arms and legs were broken with a hatchet, in order to prevent the possibility of resistance. In 1837 Gen. (then Capt.) Campbell was appointed assistant-collector in Ganjam, the adjoining district in the plains, and with varied success devoted much of his time to endeavoring to suppress the rite. He was succeeded in 1841 by Maj. (then Lieut.) Macpherson, C.B. Encouraged by the success of his labors, the government in 1845 established, under Macpherson, a separate agency for the suppression of Meriah sacrifices in the hill tracts of Orissa, in which he was succeeded, in 1847, by Maj.Gen. Campbell, who carried on, with undiminished success, the good work commenced by Macpherson, pushing his inquiries and exerting his authority among the tribes unvisited by his predecessor; and reports have been sent in from all parts of the country, stating that for several years hardly any Meriah sacrifices have taken place in the great hill tract of Orissa. In the year 1852–53 all victims retained for sacrifice were demanded, and in only one instance had the demand to be followed up by force. The practice of female infanticide has now also become almost wholly suppressed. The irrigation of a large portion of Orissa is provided for by an extensive and costly system of canals taken over by the government in 1868.

See *Report by Lieut. M'Pherson,* 1841; *An Account of the Religion of the Khonds in Orissa, idem* in the *Trans. of Asiat. Societies,* 1851; Campbell's *Personal Narrative of Service Amongst the Wild Tribes of Khondistan,* 1864; *Calcutta Review,* Nos. IX., XI., XV., and XX.; Kaye's *History of the Administration of the E. I. Coy.,* 1853; *Memoir: Administration of India During Last Thirty Years,* 1858; *Indian Records—History of the Rise and Progress of the Operations for the Suppression of Human Sacrifice and Female Infanticide in the Hill Tracts of Orissa* (1854); and *Orissa,* by W. W. Hunter, director-general of the statistical survey of India (1872).

ORISTA'NO, a t. and inferior river port on the w. coast of Sardinia, 41 m. n. of Iglesias. It stands in a fruitful, well-cultivated plain, about a mile from the left bank of the Tirso or Oristano, and 2½ m. from its mouth in the gulf of Oristano, which is about 10 m. in length, with a breadth of 5 miles. It is surrounded by ancient walls flanked with towers; contains a cathedral with a great clock tower, the most conspicuous object in the town; an archbishop's palace, college, and several churches and convents. It carries on manufactures of ironware, cutlery, and agricultural implements, and a number of its inhabitants are engaged in the tunny fishery on the coast. Corn, salt fish, and the wine of Vernaccia are exported. In winter the town is busy and lively; but in summer it is unhealthy, and during that season all who can afford to do so, leave it. Pop. about 3,000.

ORIZA'BA, a t. of Mexico, in the state of Vera Cruz, 78 m. e. by s. of Puebla, and 25 m. s. of the volcano of Orizaba. The vicinity is unusually fertile, and is covered with forests. The town contains numerous churches, a high school, and an extensive cotton

spinning factory. Coarse cloths and tobacco are largely manufactured, and there is much general industry. Pop. about 20,000.

ORKNEY ISLANDS, a large group of islands in Scotland, separated from Caithness by the Pentland firth (q. v.), lie between 58° 41′ 24″ and 59° 23′ 2″ n. lat., and between 2° 22′ 2″ and 3° 25′ 10″ w. long.; are 67 in number at low water, of which 28, besides Pomona, or the Mainland, are inhabited. The area of the Orkney islands is 375 sq. m., or 239,625 imperial acres. The surface is very irregular, and the land is indented by numerous arms of the sea. The highest hill is the Ward of Hoy, 1564 feet. The rocks are of the old red sandstone formation, except a small granite district near Stromness. Previous to the middle of last century, the agriculture of Orkney was, in more than an ordinary degree for the time, in a primitive state. There was little communication then with the mainland, and improvements were slowly adopted. The spinning-wheel, for instance, was not introduced there for half a century after it was in use elsewhere. Until toward the end of last century, little advance seems to have been made in the management of the land, the inhabitants deeming it more important and profitable to direct their attention to the manufacture of kelp. The people used to suffer periodically from bad seasons and violent storms, when less help could be afforded to them from without. In 1778 a great hurricane of four hours' duration drove the sea-spray over the islands. The grain crop was in consequence *sea-gusted*, and rendered almost worthless, and there required to be imported quantities of meal and barley, besides other articles, costing £15,000, or nearly twice the gross rental of the county. Orkney was formerly divided into 32 parishes, having 8 parish ministers. It now contains 22 parishes, forming 3 presbyteries and 1 synod. There are also about 30 congregations belonging to the Free and United Presbyterian churches, besides 3 Independent, and one or two others.

The temperature of Orkney is comparatively mild, considering its northern latitude. This arises partly from its being surrounded by the sea, but chiefly from the neighborhood of the Gulf Stream to the western shores. For the 13 years ending 1869, the mean annual temperature was 46°; the mean temperature of January and February, the coldest months, 39°; and that of July, 55°. The annual rainfall varies from about 28 in. on the e. side of the isles to 37 in. on the west.

The exports are chiefly of fish and agricultural produce, of which cattle are the principal. In 1894 there were about 1,259 men and 391 boats employed in the fisheries.

The number of horses in 1890 was 5,861; cattle, 24,040; sheep, 32,408; swine, 4,587. The number of occupants of land was 3,147.

The only town is Kirkwall (q. v.), the capital (situated in Pomona). There are two villages, Stromness and St. Margaret's Hope. The valued rent of the Orkney islands in 1653 was £57,149 Scots, or £4,763 sterling. The valuation (exclusive of the burgh of Kirkwall) in 1878–9 was £65,061. In 1881, inhabited houses in the Orkney islands, 6,288; pop. 32,037. Pop. '91, 30,453. The Orkney islands unite with the Shetland group of islands in returning one member to parliament.

The Orkneys, under the name *Orcades* [whence the modern adjective, Orcadian], are mentioned by the ancient geographers, Pliny, Ptolemy, Mela, and by other classical writers, but of their inhabitants we know almost nothing till the dawn of the middle ages. They were most probably of the same stock as the British Celts. From an early period, however, the Norsemen resorted to these islands, as a convenient spot from which to make a descent on the Scotch and English coasts. In 876 Harald Haarfager conquered both them and the Hebrides. During the greater part of the 10th c. they were ruled by independent Scandinavian jarls (earls), but in 1098 they became formally subject to the Norwegian crown. Thus they remained till 1468, when they were given to James III. of Scotland as a security for the dowry of his wife, Margaret of Denmark. The islands were never redeemed from this pledge; and in 1590, on the marriage of James I. with the Danish princess Anne, Denmark formally resigned all pretensions to the sovereignty of the Orkneys. During their long connection, however, with Norway and Denmark, all traces of the primitive population disappeared. The present proprietors of land are chiefly of Scotch descent; and the inhabitants generally are a mixed race of Scandinavian and Scotch descent.

ORLE, in heraldry, one of the charges known under the name of sub-ordinaries, said to be the diminutive of a Bordure (q.v.), but differing from it in being detached from the sides of the shield. It may be the sole charge in a shield. Or, an orle gules was the coat borne by John Baliol. An orle of heraldric charges of any kind denotes a certain number (generally eight) of these charges placed in orle, as in the coat of the old Scottish family of Gladstanes of that Ilk; argent, a savage's head couped, distilling drops of blood proper, thereon a bonnet composed of bay and holly leaves all proper, within an orle of eight martlets sable.

ORLEANS, an island in the St. Lawrence river, belonging to Montgomery co., Quebec, Canada; 69 sq. m.; pop. abt. 5000. The surface is undulating and covered in some portions with extensive forests. The soil is rich, and in a high state of cultivation. There are a number of villages on the island.

ORLEANS, a parish in s.e. Louisiana, on the Mississippi river, bounded on the n. by lake Pontchartrain, on the s.e. by lake Borgne, and on the s. by the Mississippi; intersected by several important railroads; 187 sq. m.; pop. '90, 242,039, chiefly of American birth—includ. colored. The surface is low, and liable to inundation, and much of it is

swampy. The soil along the Mississippi is fertile. The principal production is sugar. The city of New Orleans constitutes the greater part of the co., which is the most populous in the state. Co. seat, New Orleans.

ORLEANS, a co. in w. New York, bounded on the n. by lake Ontario, drained by Oak Orchard creek; on the New York Central and Hudson River railroad, and the Erie canal; 399 sq. m.; pop. '90, 30,803, chiefly of American birth. The surface is rolling, and the soil fertile. The principal productions are corn, wheat, hay, oats, and fruits. Wool, flax, hops, and tobacco are also raised. There are flour and saw mills, cooper shops, manufactories of carriages, harnesses, etc. Co. seat, Albion.

ORLEANS, a co. in n. Vermont, watered by the Missisquoi, Clyde, Barton, and Black rivers; on the Canadian Pacific and the Boston and Maine railroads; 728 sq. m.; pop. '90, 22,101, chiefly of American birth. The surface is hilly, much of it heavily wooded with sugar maple, oak, hickory, and other trees. It contains a number of lakes, of which the largest is lake Memphremagog (q. v.). Iron ore and soapstone are found, and granite, slate and other minerals. The soil is fertile, and the principal crops are potatoes, grass, corn, and oats. Maple sugar is made, and much lumber is exported. Co. seat, Newport.

ORLÉANS, an important commercial city of France, capital of the department of Loiret, and formerly capital of the old province of Orléannais, which now forms the greater part of the departments of Loiret, Eure-et-Loir, and Loir-et-Cher, is situated on the right bank of the Loire, here crossed by a bridge, and is 75½ m. s.s.w. of Paris by railway. Orleans stands on the verge of a magnificent plain sloping toward the Loire, and watered by the Loire and Loiret, and is surrounded on the land-side by a wall. Among its principal buildings are the cathedral, with two lofty and elegant towers, one of the finest Gothic edifices in the country; the tower; bishop's residence; the houses of Joan of Arc, of Agnes Sorel, of Diane de Poitiers, of François I., of Pothier; the churches and hospitals, which are numerous; the *musée*, the theater, etc. The town contains three statues of Joan of Arc, of which the equestrian one was inaugurated in 1855. The situation of the town has many commercial advantages, arising from its position on a navigable river, on lines of railway which connect it with Paris and the great trading towns in the s. of France, and on the canal which connects the Loire with the Seine. Hosiery, cotton and linen goods, refined sugar, vinegar, bleached wax, leather, etc., are manufactured; and the trade is chiefly in stockings, sheepskins, wine, brandy, corn, and sugar. Pop. '91, 63,705; '96, 66,619.

Orléans, originally called *Genabum*, afterwards *Aureliani* (probably from the emperor Aurelian), of which the modern name is only a corruption, was besieged by Attila in 451, but relieved by the Romans, who here defeated Attila. It afterwards passed into the hands of the Franks, was taken by the Northmen in 855, and again in 865. In 1428 it was besieged by the English under the duke of Bedford, but was delivered by Joan of Arc (q. v.), therefore named the Maid of Orléans. In the wars of the 16th c., Orléans suffered severely. It was taken by the Germans in 1870, and was their center of operations against the French army of the Loire.

ORLÉANS, Henri, Prince d'; eldest son of Robert, duc de Chartres, b. Oct. 15, 1867, traveled 1889–90 with Bonvalot to Central Asia, in 1892 to Madagascar and in 1895 to Tonquin where he discovered the sources of the Irrawaddy. In 1897 his criticisms of the Italian army in Abyssinia led to a duel with the Prince of Turin, in which Henri was seriously wounded. He has written *Une Excursion en Indo-Chine* (1892), *Autour du Tonkin* (1893), *A Madagascar* (1895).

ORLÉANS, House of. See Bourbon.

ORLÉANS, Jean Baptiste Gaston, Duc d', third son of Henry IV. of France and Marie de Medici; was b. at Fontainebleau, April 25, 1608. He possessed tolerable abilities, but his education was neglected. On his marriage with Marie of Bourbon, duchess of Montpensier, in 1626, he received the duchy of Orléans as appanage. His wife soon died, leaving one daughter, the celebrated Mademoiselle de Montpensier. His brother, Louis XIII., regarded him with dislike as heir-presumptive to the throne, the queen having no children; and the treatment which he received at the hands of the king, and of Richelieu, led him to join with his mother in attempting the overthrow of that minister. He left the court with a number of other great nobles in Feb., 1631; sought the support of the duke of Lorraine, whose sister he married, and raised in the Spanish Netherlands a corps of 2,000 men, at the head of which he crossed the French frontier assuming the title of lieut.-gen. of the kingdom; but was completely defeated by Marshal Schomberg at Castelnaudary, and fled to the duke of Lorraine, whom he thereby involved in ruin. In 1634, however, he returned to the French court. After Richelieu's death, a reconciliation was effected between him and his brother, the king, by the ministers Mazarin and Chavigny; and Louis XIII. appointed him lieut.-gen. of the kingdom during the minority of Louis XIV. Mazarin and the queen-mother, Anne of Austria, attempting to assume all power to themselves, the duke placed himself at the head of the Fronde (q. v.); but with his usual vacillating weakness and selfish sacrifice of his friends, soon made terms again with the court. Yet, when Mazarin returned from banishment in 1652, the duke again assembled troops for the prince of Condé, upon which account,

after the disturbances were ended, he was confined to his castle of Blois, where he died Feb. 2, 1660. He left three daughters by his second marriage.

ORLÉANS, Louis Philippe Joseph, Duc d', b. April 13, 1747, was the great-grandson of the preceding. He possessed very good abilities; but early fell into the grossest debaucheries, in which he continued to the end of his career. Louis XVI. disliked him on account of his debased character, and the queen for his obstrusiveness. He became gradually estranged from the court, sought popularity and obtained it, and embraced the cause of American independence. In the assembly of notables in 1787 he declared against the ministeral proposals; and when the king sought to overcome the resistance of the parliament by a *Lit de justice,* he protested against the proceeding. On the assembly of the states-general, he took the popular side, and voted with the extreme left in the national assembly; seeking at the same time to please the populace by profuse expenditure, with the hope of being made lieut.gen. of the kingdom, or perhaps of opening for himself a way to the throne. When the insurrectionary movements began in Paris in 1789, he promoted them by secret agents and money. The court sent him on an ostensibly diplomatic mission to England, from which he returned after more than six months' absence, in July, 1790, and unscrupulously engaged in new intrigues hostile to the king. But he began to find that he himself was made the mere tool of a party, who availed themselves of his influence and wealth for their own purposes, and this discovery cooled his revolutionary fervor. He withdrew from the Jacobin club, was reconciled to the king, and appeared at court; but was treated with such disrespect by the courtiers, that he turned away, and from that time followed in blind rage the stream of the revolution. He joined Danton's party, was concerned in insurrections, disclaimed all pretentions to the throne, renounced his titles, assumed the name of Philippe Egalité, was addressed as citizen Egalité, and was returned by the department of Seine and Marne to the national convention, in which he took his place among the mountain party. He voted for the death of the king, being, it is said, himself threatened with death by the Jacobins if he should do otherwise, but alleging his sense of duty and his belief that every one who did anything contrary to the sovereignty of the people deserved death. The vote was received with a cry of disgust, and by no means increased the safety of his own position. The mountain party were dissatisfied with him, because he did not give up the whole of his immense wealth for party purposes. After the desertion of his son, the duke de Chartres (see Louis Philippe), the decree for the imprisonment of all the Bourbons was applied to him. He was thrown into prison with his family in Marseille, and was brought before the tribunal of the department of Bouches de Rhône on a charge of high treason. He was acquitted, but the committee of public safety immediately brought him before the revolutionary tribunal in Paris; and on Nov. 6, 1793 he was condemned, and on the same day executed amidst the execrations of the multitude which had so often applauded him.

ORLÉANS, Prince Louis Phillipe Robert, duke of, eldest son of the late Count of Paris, b. 6 Feb. 1869. Becoming of age, he applied in Paris for the customary military service, but was arrested under the Expulsion Bill of 1886, which prevents the direct heirs of former reigning families from residing in France. Nominally imprisoned for a few months, he was liberated by President Carnot, escorted to the Swiss frontier, and afterwards lived in Brussels.

ORLÉANS, Philippe, Duc d', regent of France during the minority of Louis XV., was the son of Philippe, duc d'Orleans, and the grandson of Louis XIII., and was b. Aug. 4, 1674. He possessed excellent talents, and made unusual attainments both in science and belles lettres; but his tutor, cardinal Dubois (q.v.), did not scruple to minister to the strong passions of the young prince, and exercised a most pernicious influence over him. He gave himself up to debauchery. The king compelled him to marry Mademoiselle de Blois, his daughter by Mme. de Montespan. He astonished and alarmed the court by protesting against his exclusion by the testament of Charles II. from all right of succession to the throne of Spain, and by the attention which he immediately began to give to military and political affairs. His military talents, however, led to his employment in the wars in Italy and in Spain; but his presence in Madrid after his victories was regarded with apprehension both by Philip V. and by Louis XIV. He had, indeed, formed the design of taking possession of the Spanish throne for himself. In consequence of this, he lived for some years in complete exile from the court, and much dreaded by it; spending his time both in vicious excesses, and in the cultivation of the fine arts and the study of chemistry. This study afforded a pretext to Mme. de Maintenon and her party for accusing him of poisoning the dauphin and others of the royal family, who died suddenly, and in rapid succession, of malignant fever, in 1711. The king refused an investigation which the duke demanded. Louis, having legitimized his sons, the duke of Maine and the count of Toulouse, appointed the duke of Orleans only president of the regency and not regent, giving the guardianship of his youthful heir and the command of the household troops to the duke of Maine; but all this was set aside at his death, and the duke of Orleans became sole regent. He was popular, and his first measures increased his popularity; but the financial affairs of the

kingdom were perplexing, and the regent's adoption of the schemes of Law (q.v.) led to disastrous results. Meanwhile, on Aug. 26, 1718, he held the celebrated *Lit de justice*, in which he prohibited the parliament of Paris from meddling with financial or political affairs, and declared the legitimized sons of Louis XIV. incapable of succeeding to the throne. Dubois, who still possessed an unhappy influence over his former pupil, became prime-minister, and eventually ruler of France; the regent, who was really a man of far higher abilities, neglecting all duties, and pursuing a course of profligacy almost unequaled in the worst instances of antiquity. His eldest daughter, the duchess de Berry, followed his example, and brought herself to any early grave. Dubois, wishing to be made a cardinal, persuaded the regent to sacrifice the Jansenists, and to compel the parliament in 1722 to recognize the bull *Unigenitus* (q.v.). After the king's coronation, Feb. 15, 1723, and the death of Dubois in August, the duke of Orleans, although disliking public affairs, consented to become prime-minister; but died on December 2 of the same year, physically exhausted by his incessant debauchery. The influence of his religious and other opinions, and the example of his immoralities, powerfully tended to promote that state of things which eventually produced the horrors of the French revolution.

ORLÉANS CLOTH, a kind of stuff, in which the warp is of cotton and the weft of worsted.

ORLÉANS, Maid of. See Joan of Arc.

ORLOFF is the name of a distinguished Russian family of recent origin in European family annals. Ivan was noted, first, for having taken part in a mutiny in 1689 against the young Czar Peter (the Great). His coolness at the scaffold obtained him a pardon, and a commission in the army; and he adopted the name of Orloff. II. Grigori Grégoriewitch, grandson of the preceding, 1734–83; an intriguer, a protégé of Catherine II., who helped her dethrone her husband Peter III., and when Catherine became empress vainly sought to marry her. She became tired of him, sent him to Moscow when it was infected with the plague, where he so distinguished himself by energetic performance of humane duties in arresting the pestilence that he was reinstated in her favor, afterward sent to prison by her, and died a wanderer and insane. III. Alexei, 1736–1808; brother of the preceding, is said to have acquired the favor of the same Catherine by strangling her husband with his own hands. In 1768 was made admiral of the Russian fleet in the Grecian archipelago, achieved brilliant successes in battles with the Turks in 1770; was rewarded with honor, then exiled by Czar Paul. IV. Fedor, 1741–96; another brother, made general-in-chief of an army serving against the Turks, and the father of four illegitimate sons, by whom the family name has been continued. V. Alexei, 1786–1861; one of the above sons, was engaged in the campaign against the first Napoleon, aid-de-camp of Alexander I. His energy on the accession of Nicholas in 1825 aided to suppress the conspiracy on that occasion, for which he was promoted; fought against the Turks in 1828, negotiated the peace of Adrianople in 1829, and superintended the movements of the Russian army in Poland in 1830–31. He was suspected of poisoning the Grand Duke Constantine and Marshal Diebitsch, but the charge was not sustained. In 1833 he was a party to the secret treaty with Turkey by which the Bosporus and the Dardenelles were closed to all but Russian ships of war. In 1844 he was at the head of the police system of Russia, and after the death of Nicholas retained the favor of Alexander II. In 1856 he was Russia's chief representative at the congress of Paris, and on his return to Russia was made president of the grand council of Russia, and a prince. VI. Nikolai a son of the preceding, b. in 1827; minister at Brussels in 1859; ambassador to Paris in 1872; recipient of the grand cross of the legion of honor from President MacMahon in 1875; and author of a work published in St. Petersburg in 1856, on the campaign in Prussia in 1806. He d. 1885.

ORLOFF DIAMOND. See Diamond.

ORLOP (Dutch, *overloop*, that which runs over, or covers), in ships of war, is the lowest deck, immediately above the hold. It contains the magazine, bread-room, and various store-rooms; and is used in time of action for the reception and treatment of the wounded, as, from being below the water-line, it is the safest part of the ship.

ORME, Robert, 1728–1801; b. Hindustan, of English parentage, son of Dr. Alexander Orme, physician and surgeon of the British army in Bombay; educated at Harrow, went back to India in 1742, as a writer in the employ of the East India company. He resided in Anjengo, a city of Travancore. In 1752 he went to England in company with Capt. Clive, afterwards lord Clive, baron of Plassey, his friend for many years. He returned again to India, and in 1754 become fourth member of the council at fort Saint George, Madras, and rose to be commissary and accountant-general, 1757–58. In 1759 he went to England, having made a small fortune. He was influential in establishing the power of Great Britain in India, and active in the interest of his friend, capt. Clive, whom he succeeded in having sent as military commander of that country. He returned to England finally in 1859, and became historiographer to the East India company, with a salary of £300 per annum, retiring to Ealing in 1792, where he passed the

remainder of his life. In 1763 he published the first vol. of the *History of the Military Transactions of the British Nation in Hindustan*, and in 1775 the second vol., the 3 vols. appearing in 1780. In 1782 appeared *Historical Fragments of the Mogul Empire of the Mahrattas*, during the reign of Aurungzebe, to which was prefixed a life of the author. In reference to his history Macaulay says: "He is inferior to no English historian in style and power of painting, is minute even to tediousness." "In one volume he allots, on an average, a closely-printed quarto page to the events of every forty-eight hours." Robertson and Sterne were great admirers of his history, and Boswell, in his life of Johnson calls him "the able and eloquent historian of Hindustan, who expressed a great admiration of Johnson....Johnson was much pleased with such praise from such a man as Orme."

ORME'S HEAD, Great, a headland in the n.e. of Caernarvonshire, North Wales, 5 m. n.n.w. of Conway, is an enormous mass of limestone rock, surmounted by a light-house, and forming the extreme point of the western shore of Orme's bay. Lat. 53° 21′ n., long. 3° 52′ w.—Little Orme's Head forms the eastern extremity of the same bay.

ORMISTON, William, d.d., ll.d., b. Lanarkshire, Scotland, 1821; educated at Victoria coll., Coburg, Canada; was prof. of moral philosophy in this institution for one year; was pastor of a Pres. church at Clarke, Durham co., Canada, 1853–57; master and lecturer in the normal school, Toronto; examiner in the univ. of Toronto, and inspector of grammar schools and examiner in Knox coll.; pastor of Central Pres. church, Hamilton, Canada, 1857–70; and from 1870 to 1888 was one of the pastors of the Collegiate Reformed (Dutch) church, New York. Dr. Ormiston assisted in preparing a series of school books, and edited, with notes, *Meyer on the Acts*, besides publishing sermons, pamphlets, etc. He has prepared for several years the International Sunday-school lessons. In 1890 he engaged in evangelist work in California.

OR'MOLU is a variety of brass, consisting of zinc 25 parts, and copper 75 parts, which has a nearer resemblance in color to gold than ordinary brass (q. v.). It is extensively used for castings of ornaments for furniture, candelabras, and such articles. When the casting is made, its color is brought out by a *pickle* of dilute sulphuric acid, after which the acid is removed by water, and a liquor varnish is put on to keep it from tarnishing.

ORMOND, James Butler, Duke of, was the first of the ancient Anglo-Irish family of Butler on whom the ducal title was conferred. The family was of illustrious antiquity. Genealogical legend carried it back to the dukes of Normandy before the conquest, and it is certain that at the dawn of the 13th c., it held the hereditary office of royal cup-bearer or *butler*, whence the family name. The subject of the present article was b. in London in 1610. His father, the son of the celebrated Walter, earl of Ormond, was drowned in crossing the channel; and the old earl having incurred the displeasure of the king, James I., and being thrown into prison, James, who on his father's death became, as Viscount Thurles, the heir of the title, was seized as a royal ward, and placed under the guardianship of the archbishop of Canterbury. On the restoration of his grandfather to liberty, he also was released; and in his 20th year he married his cousin, Lady Elizabeth Preston, and in 1632 succeeded, upon his grandfather's death, to the earldom and estates of Ormond. During the Strafford administration in Ireland, Ormond distinguished himself so much, that on Strafford's recall he recommended Ormond to the king; and in the rebellion of 1640, Ormond was appointed to the chief command of the army. During the troubled times which followed, he conducted himself with undoubted ability, although, as a necessary consequence of the numberless divisions and subdivisions of party which then prevailed in Ireland, he failed to satisfy any one of the conflicting sections; and when, in 1643, he concluded an armistice, his policy was loudly condemned as well by the friends as by the enemies of the royalist party in England. During the long contest of Charles with the parliament, Ormond continued to uphold the royal interest in his Irish government; and when the last crisis of the king's fortunes came, he resigned his Irish command, and retired to France, from which country he again returned to Ireland with the all but desperate design of restoring the royal authority, and after a gallant but unequal struggle, was compelled, in 1650, to return once more to France. His services to the royal cause continued unremitting during his exile; and at the restoration he accompanied Charles II. on his return, and was rewarded for his fidelity by the ducal title of Ormond. His after-life was less eventful, although he twice again returned to the government of Ireland. It was in 1670 that the well-known attempt was made by the notorious Col. Blood (q.v.) upon the life of Ormond. As he was returning from a civic festival, he was attacked by Blood and a party of ruffians, and was dragged from his coach with the intention of his being hanged at Tyburn. The attempt drew additional interest from its being commonly supposed to have been instigated by the profligate duke of Buckingham, Ormond's inveterate foe. He escaped uninjured, and lived until the year 1688. His letters and other papers are full of deep historical interest. See Carte's *Life of Ormond.*

ORMSBY, a co. in w. Nevada, bounded on the w. by lake Tahoe, drained by Carson river; on the Virginia and Truckee railroad; about 144 sq.m.; pop. '90, 4883 chiefly

of American birth. The surface is mountainous, well wooded, and crossed in the w. by an offshoot of the Sierra Nevada range. The soil especially in the valley of the Carson is fertile, and produces wheat, corn, oats, and barley. There are mines of gold, silver, and iron. Large amounts of lumber are exported. There are quartz, saw, and planing mills. Co. seat, Carson city.

ORMSKIRK, a parl. and market t. of England, in Lancashire, in the center of a rich and populous agricultural district, 8 m. s.e. by s. of Southport by the Lancashire and Yorkshire railway. The parish church has both a tower and spire. Its grammar school has an annual income from endowment of £150. Silk-weaving, rope-making, basket-making, and brewing are the principal branches of industry. There are large collieries in the vicinity. Pop. '91, 6300.

ORMUZ, or HORMUZ, a small island in the Persian gulf, at the entrance of the Persian gulf, and within 10 m. of the Persian coast. It is about 13 m. in circumference, and belonged to the Imaum of Muscat till 1854. In the 16th c. it was taken by the Portuguese, and being made by them an entrepôt for goods from India, Persia, and Turkistan, it became important, and the town of the same name rose in population until it had 40,000 inhabitants. The town was demolished in 1622, by Shah Abbás, assisted by the English, and its trade was removed to Gombroon (q. v.).

ORMUZD (Ahurmazd, Auramazda, Hormazd, Ormazd), corrupted from Ahurô-Mazdaô, i.e., that Ahura (Vedic Asura), or "spiritual being," who is called Mazdaô (i.e., Vedic Medhâs) = "creator of all things;" the name of the supreme deity of the ancient Persians, and of their descendants the Guebres and Parsees. It was at first emphatically employed in this sense by Zoroaster, or Zarathustra Spitama. Ormuzd is, according to Zoroaster's original doctrine, the creator of the earthly and spiritual life, the lord of the whole universe, in whose hands are all creatures. He is the light and the source of light, the wisdom and the intellect, and is in the possession of all good things, such as "the good mind," "immortality," "wholesomeness," "the best truth," "abundance," etc.; which gifts he bestows upon the pure in thoughts, deeds, and words, while the wicked are punished by him according to their wickedness. ("For thou art through purity, the holy over the wicked, the ruler over all, the heavenly, the friend of both worlds, Mazda! . . . . Father of the pure creatures at the beginning, who hath created the way of the sun, of the stars, who causeth the moon to wax and to wane . . . . He holdeth the earth and the unsupported [heavenly bodies?], the waters and the trees, and giveth swiftness to the wind and the clouds . . . . The creator of the good mind, the working good, hath made light as well as darkness, sleep and waking, the morning dawns, the noons, the nights," etc.—*Yazna*, 43.) Sprung from Zarvan-Akarana (the boundless time), i.e., being from eternity, self-existing, neither born nor created, he unites within himself—as does man and everything else existing,—the two primeval principles of good and evil, the Çpento-mainyus, i.e., the white, holy spirit and the Angrô-mainyus (corrupted into Ahriman, = the dark spirit. This Zoroastrian conception of the two sides of the divine being—itself one and indivisible—has, however, in the course of time, partly through misunderstandings and willfully false interpretations, undergone important changes. While the Zervan-Akarana was transformed by the Magi—in opposition to the Zendiks—into the Supreme Being itself, the philosophical notion of a duality in Ormuzd became the theological dogma of god and devil, jealous of each other's power, bent upon the destruction of each other's works, and consequently in constant war with each other, they and their armies. Both are—according to this corrupted view of later times, by means of which the genuine one has been forgotten up to our day—supreme rulers; both have their fixed number of councilors (sprung from an egg, *Plut. Isis and Osiris*), who are the actual governors of the whole universe, each in his special province; which councilors, however, are neither more nor less than certain abstract ideas of Zoroaster. One personal archangel alone is assumed by the latter, viz., Sraosha (Serosh, cf. Sansr. Shruti), i.e., hearing, tradition. He is vested with very high powers, and stands between Ormuzd and man; he is the teacher of good religion; he shows the way to heaven, and pronounces judgment over human actions after death. He is the personification of the whole divine worship and its outward manifestations, the symbols, prayers, sacrifices, rites, etc., and the chief combatant of the influence of the Devas; who stand symbolically for the Brahmanic religion. Ormuzd is represented as sitting upon a throne of light, as a venerable man, or seated upon a bull, etc.—For further particulars about the seasons and the manner of his worship, as well as the general relations between his and the Brahmanic religion (both the result of a prehistoric conflict between the Iranians and those Aryan brother-tribes who immigrated into Hindustan proper), we must refer to PARSEES, PERSIA, and ZOROASTER.

ORNAMENTATION, or DECORATION, in architecture, applies to something which is added to the simple constructive features, or to the form given to those features, for the purpose of making them beautiful or elegant. Thus, the Doric shaft, while answering the constructive purposes of a simple square or round pier, is ornamented with fluting; and its capital, with its beautifully proportioned echinus and abacus, supports as a plain slab would do the weight of the entablature. The other classic orders illustrate this in

a richer manner. Thus, the Corinthian column, with its fluted and elegant shaft, resting on an ornamented base, and crowned by an ornamented capital, takes the place of what might have been, had utility alone been consulted, a plain pier of rubble-work, with a rough stone to rest upon, and another on the top to receive the load.

In classic architecture, as in every good style, the same principle pervades all the ornamental features—viz., *that they are constructive features ornamented in a manner suitable to their use;* for instance, a column being a member for support, should be of such a form as to denote this; the constructive use of a cornice being to protect the top of the wall, and to shield the front of it from the rain and sun, it should be made of such a form as to do this, and also to *look* as if it did it—to express its purpose. In classic architecture, the cornice consists of several members, in which the constructive decoration is well seen; the mutules and modillions beautifully indicating in an ornamental manner their original use, while the leaf enrichments of the small moldings give life and animation to the building. In mediæval art the same principle prevails in a much greater degree, and over a more complex system of construction. The shafts, with their elegant and purpose-like bases and caps, are arranged so that each supports a separate member of the vaulting. The arch-moldings are divided so as to indicate the rings of their constructive formation. The buttresses, so elegant in outline, express the part they serve in supporting the vaulting; the pinnacles, with their ornamental finials, are the decorated dead-weights which steady the buttresses. The foliage and smaller ornament is also beautifully and suitably applied, as the growth and vigor of the supporting capitals and corbels, and the running foliage of the string-courses, arch-moldings, etc., fully illustrate.

There are, no doubt, many styles of art to which these remarks can hardly be said to apply; as, for example, the Assyrian, Egyptian, and Hindu styles, where we find many features applied in a manner meant to be ornamental, although actually contrary to their constructive use. In these styles (and also in Greek architecture) human figures, bulls, and other animals are placed as columns to carry the weight of a superincumbent mass. This is evidently wrong in principle, except when the figure is placed in an attitude to indicate that he is supporting a weight, as the Greek Atlantes do; but in the former cases religious notions seem to have overcome true artistic feeling. There are also many forms of ornament used in all styles, the origin of which is obscure, and their advantage doubtful; such are the zigzag, chevron, billet, etc., so common in early mediæval art, and the scrolls of Ionic and Indian art, and the complications of the interlacing work of the north in the middle ages. Such things may be admissible in colored decoration, such as the confused patterns of Saracenic art and the shell-patterns of Indian art; but where ornamental *form* is wanted, unless the requirements of the construction are carefully followed as the guide to the decoration, all principle is lost, and the ornament runs wild. This has frequently occurred in the history of art, and in no case more markedly than in the art of the renaissance.

The material in use must also have an influence on the form and style of the ornament. Thus, stone-carving and metal-work must evidently require different treatment. Fac-simile leaves might be formed in iron, but could not be so carved in stone. This constructive element should be carefully attended to in designing. All imitative art must be to some extent conventional. Natural objects, such as leaves, flowers, etc., cannot be copied absolutely literally; and in suiting the conventional treatment to the nature of the material used lies the great skill of the artist.

ORNE, a department of France formed out of the old provinces of Normandy and Perche, is separated on the n. from the English channel (La Manche) by the department of Calvados. Area, 2,354 sq.m., more than one-half of which is cultivable land; pop. '96, 339,162. A range of wooded hills, nowhere rising above 1370 feet, extends across the south of the department from east to west. North of this range the surface slopes toward the English channel; south of it, toward the Atlantic. The principal rivers are the Orne (which gives name to the department), the Rille, the Sarthe, and Huisne. The climate is damp, though in general temperate, and the winters are severe. The soil is fertile, but agriculture is not in an advanced state. The inhabitants consume one-third more grain produce than is grown on the land. There are several millions of apple and pear trees planted along the roads, etc., and cider is extensively made. Cattle, and horses of the purest Norman breed, are reared. Mining is an important branch of industry; the chief products are iron and copper; marble, granite, and other stones for building are quarried. The department is divided into four arrondissements, Alençon, Argentan, Domfront, and Mortagne; capital, Alençon.

ORNITHOLOGY (Gr. *ornis,* a bird, and *logos,* a discourse), that branch of zoology of which the subject is birds. By Aristotle, Pliny, and others of the ancients this study was prosecuted to some extent, along with other parts of natural history; but it is only in modern times that ornithology has assumed the rank of a distinct branch of science. The first modern author to attempt a scientific classification of birds seems to have been Pierre Belon, noted also as an ichthyologist, whose *Historia Avium* was published about the middle of the 16th century. Some of his classes are very heterogeneous assemblages;

but the first three, viz., birds of prey, web-footed birds, and *grallæ*, are so natural as to have been acknowledged, with some modification of their limits, in all subsequent systems. In the 17th c. much progress was made in the observation and description of species, not only of the birds of Europe, but of other parts of the world. In the latter part of the century attention began to be given to the anatomy of birds. An ornithological system, more perfect than that of Belon, was proposed by Willughby about 1676, and afterwards matured and improved by Ray. On this system that of Linné was founded. During the 18th c. the progress of ornithology was very rapid. The birds of many countries were described in works specially devoted to them, and the habits of birds began to be carefully observed; but the system of Linné, as framed by him before the middle of the century, continued to prevail almost unmodified till the publication of Cuvier's *Règne Animal* in 1817. Latham, Lacépède, Illiger, Temminck, and others had indeed previously proposed systems more or less different from it; and systems have since been proposed by others, particularly by Mr. Vigors and Mr. Swainson, who have endeavored to accommodate the classification to certain first principles which they supposed to pervade nature, but which other naturalists in general regard as fanciful. The system of Cuvier is now generally received by ornithologists, as that of Linné formerly was; not, however, without modifications, by which it has been sought to accommodate it to the progress of science, and some of the names introduced by other authors have obtained very general acceptance. The system of Linné divided birds into six orders—*accipitres*, *picæ*, *anseres*, *grallæ*, *gallinæ*, and *passeres*. That of Cuvier also divided them into six orders—*birds of prey* (the *accipitres* of Linné, now often called *raptores*), *passerine birds* (*passerinæ*, now more generally called *insessores*, or *perching birds*, including most of the Linnean *passeres*, and part of *picæ*), *climbers* (*scansores*, part of the Linnean *picæ*, and often designated *zygodactyli* or *zygodactylous birds*), *gallinaceous birds* (now often called *rasores*, the Linnean *gallinæ*, but including also the pigeons or *columbidæ*, which Linné placed among *passeres*), *stilt-birds*, often called *waders* (*grallatores*, the Linnean *grallæ*), and *web-footed birds* (*palmipedes*, now also known as *natatores* or *swimmers*). These orders are noticed in separate articles. Perhaps the most important modification of Cuvier's system which has been proposed is the separation of the *brevipennes* or *struthious birds* from *grallæ*, and their formation into a distinct order, sometimes called *cursores* or *runners;* and next to this may be mentioned the proposed separation of *columbidæ* from gallinaceous birds.—The progress of ornithology since the commencement of the 19th c. has been very rapid; every department of it has been assiduously cultivated, and many of the works published have been not only of great merit, but very sumptuous and beautiful. The works of Audubon and Gould perhaps merit particular notice. See BIRDS.

ORNITHORHYN'CHUS. See DUCK-BILL.

ORNITHOSAU'RIANS. See PTERODACTYL.

OROBAN'CHEÆ, or OROBRANCHA'CEÆ, a natural order of exogenous plants, all herbaceous, and destitute of true leaves, but having their stems covered with brown or colorless scales. They all grow parasitically upon the roots of other plants. The calyx is divided, persistent, inferior; the corolla monopetalous, hypogynous, and irregular. The stamens are four, two long and two short; the ovary 1-celled, seated in a fleshy disk, composed of two carpels, with one style. The fruit is capsular, inclosed within the withered corolla, 1-celled, 2-valved. The seeds are numerous, and very minute. There are about 120 known species, natives chiefly of temperate climates, and generally characterized by astringency and bitterness, upon account of which some of them have been used in medicine (see CANCER ROOT). Eleven species are natives of Britain, chiefly belonging to the genus *Orobanche*, or BROOM-RAPE; to some of which important medicinal virtues were once erroneously ascribed. The enlarged base or root-stock of a species of *Orobanche* is eaten by the Indians of the north-western parts of America.

O'ROBUS, a genus of plants of the natural order *Leguminosæ*, suborder *Papilionaceæ*, allied to Vetches, and sometimes called BITTER VETCH; the style linear, downy beneath the stigma; the calyx obtuse at the base and oblique at the mouth; its upper segments deeper and shorter; the pod 1-celled, 2-valved; the leaves pinnate, without tendrils. The species are perennial herbacous plants, chiefly natives of Europe. They afford good food for cattle. Two are natives of Britain, of which the most common is *O. tuberosus*, whose racemes of purple flowers often adorn heaths and bushy places, especially in hilly districts. The stem is unbranched, erect, about a foot high, with narrow membranous wings; the leaflets in 2—4 pairs; the pods long, cylindrical, black; the root creeping and swelling out into tubers at irregular intervals. The tubers have a sweet taste, resembling that of liquorice, and are sought after by children; they are also bruised and steeped in water in some parts of the Highlands of Scotland to make a fermented liquor, and a kind of liquor is made by steeping them in whisky; they are well-flavored and nutritious when boiled or roasted, and are used in this way in the Highlands of Scotland, in Holland, Belgium, and other countries. See illus., BOTANY, vol. II., p. 800, fig. 35.

ORODUS, a genus of sharks whose remains are found in the carboniferous rocks. The crowns of the teeth present a series of blunt, but frequently ornamental cones or "hills," whence the name of the genus. See PLAGIOSTOMI and SHARK.

OROHIP'PUS. See HORSE, FOSSIL.

ORON'TES, the ancient name of a river in Syria, now called *Nahr-el-Asi.* It rises in the highest part of Cœle-Syria, near Baalbec, flows northward between the mountains of Libanus and Anti-Libanus, as far as the city of Antioch, and then westward to the Mediterranean sea, after a course of 246 m., passing by a cross valley, through the mountains of the Syrian coast. Its lower course is remarkably beautiful, surpassing everything else that can be seen in Syria. Its rocky banks are 300 ft. high, and the windings of the river show them off to the greatest advantage. Myrtle-bushes, laurels, figs, wild vines, arbutus, dwarf-oaks, and sycamores (*Acer pseudo-platanus*) are scattered about in picturesque confusion. Here and there the eye catches a glimpse of some cavern mouth or ivy-matted precipice, while from the abyss beneath ascends forever the roar of the impatient stream. The country through which it flows is of great fertility, and in many parts is richly cultivated.

OROOMIAH. See URUMEYAH.

OROSHA'ZA, a comm. of Hungary in the district of Békés, and 33 m. n.e. of Szegedin; pop. '90, 19,956. The chief occupations are cattle-raising and the cultivation of vineyards. The wine is noted for its excellence.

ORO'SIUS, PAULUS, a Spanish presbyter and historian, was born at Tarragona, and flourished in the early part of the 5th century. He went to Africa about 413 A.D., where he made the acquaintance of St. Augustine, and thence to Palestine, to study under St. Jerome, then living at Bethlehem. He finally settled down in Africa, but the date of his death is unknown. His chief work, the *Historiarum adversus Paganos Libri* 7, begins with the creation and goes down to 417 A.D. It is apologetic in design, being intended to refute the notion then current among the pagans, that the misfortunes of the Roman empire and the wretchedness of the great masses were owing to the anger of the gods at the abandonment of their worship, and the profanation of their altars. The work is a trivial, inaccurate, uncritical miscellany of facts, culled from such second-rate authorities as Justin and Eutropius; the style is elegant, but also, as Bacon says, "watery." Yet it has obtained a place in literature from being a favorite text-book of universal history during the middle ages, and had the honor of being translated into Anglo-Saxon by Alfred the Great. Some manuscripts bear the puzzling title of *Hormesta* or *Ormista,* conjectured by some to be a corruption of Or. M. 1st.; that is, *Orosii Mundi Historia* (Orosius's History of the World). The *editio princeps* of the work appeared at Vienna in 1471; the best edition is that of Havercamp (Lug. Bat. 4to, 1738). Other writings of Orosius are *Liber Apologeticus de Arbitrii Libertate,* and anti-Pelagian treatise, *Commonitorum ad Augustinium,* an explanation of the state of religious parties in Spain in his time. See Mörner's *De Orosii Vita ejusque Historiarum Libris Septem adversus Paganos* (Berl. 1844).

OROSZHAZA (pronounced *Oroshása*), a thriving t. of Hungary, in the co. of Békés Csanad, 31 m. n.e. from Szegedin. Pop. about 13,000.

OROTA'VA, a t. on the n. coast of Teneriffe, one of the Canary islands, is situated below the peak, in one of the most fertile, pleasant, and healthy districts in the world. It contains several beautiful churches, the residence of the governor, and the citadel. Fishing is carried on to some extent, and there is a trade in wine. Pop. comm. about 9,000.

ORPHAN HOUSE. See MÜLLER, GEORGE.

OR'PHEUS, (supposed to be the Vedic Ribhu or Arbhu, and epithet both of Indra and the Sun), a semi-mythic name of frequent occurrence in ancient Greek lore. The early legends call him a son of Apollo and the muse Calliope, or of Œagrus and Clio or Polymnia. His native country is Thracia, where many different localities were pointed out as his birth-place—such as the mounts of Olympus and Pangæus, the river Enipeus, the promontory of Serrhium, and several cities. Apollo bestows upon him a lyre, which Hermes invented, and by its aid Orpheus moves men and beasts, the birds in the air, the fishes in the deep, the trees, and the rocks. He accompanies the Argonauts in their expedition, and the power of his music wards off all mishaps and disasters, rocking monsters to sleep and stopping cliffs in their downward rush. His wife, Eurydice (?= Sanscr. Uru, Dawn), is bitten by a serpent (?=Night), and dies. Orpheus follows her into the infernal regions; and so powerful are his "golden tones," that even stern Pluto and Proserpina are moved to pity; while Tantalus forgets his thirst, Ixion's wheel ceases to revolve, and the Danaïdes stop in their wearisome task. He is allowed to take her back into the "light of heaven," but he must not look around while they ascend. Love or doubt, however, draws his eyes towards her, and she is lost to him forever (=first rays of the sun gleaming at the dawn make it disappear or melt into day). His death is sudden and violent. According to some accounts, it is the thunderbolt of Zeus that cuts him off, because he reveals the divine mysteries; according to others, it is Dionysius, who, angry at his refusing to worship him, causes the Menades to tear him to pieces, which pieces are collected and buried by the muses in tearful piety at Leibethra, at

the foot of Olympus, where a nightingale sings over his grave. Others, again, make the Thracian women divide his limbs between them, either from excessive madness of unrequited love, or from anger at his drawing their husbands away from them. Thus far, legend and art, in manifold hues and varieties and shapes, treat of Orpheus the fabulous. The faint glimmer of historical truth hidden beneath these myths becomes clearer in those records which speak of Orpheus as a divine bard or priest in the service of Zagreus, the Thracian Dionysius, and founder of the mysteries (q.v.); as the first musician, the first inaugurator of the rites of expiation and of the mantic art, the inventor of letters and the heroic meter; of everything, in fact, that was supposed to have contributed to the civilization and initiation into a more humane worship of the deity among the primitive inhabitants of Thracia and all Greece: a task to which Orpheus was supposed to have devoted his life after his return with the Argonauts. A kind of monastic order sprang up in later times, calling itself after him, which combined with a sort of enthusiastic creed about the migration of souls and other mystic doctrines a semi-ascetic life. Abstinence from meat (not from wine), frequent purifications and other expiatory rites, incantations, the wearing of white garments and similar things—not unlike some of the essenic manners and customs—were among their fundamental rules and ceremonies. But after a brief duration, the brotherhood, having first, during the last days of the Roman empire, passed through the stage of conscious and very profitable jugglery, sank into oblivion, together with their "orpheotelistic" formulas and sacrifices, and together with the joys of the upper and the never-ending punishments of the infernal regions which they held out to their rich dupes: according to the sums they grudged or bestowed upon them.

Orpheus has also given the name to a special literature called the Orphic, the real origin of which, however, is (according to Ottfried Müller), like Orpheus's own history, "unquestionably the darkest point in the entire history of early Greek poetry." Like Olen, Linus, Philammon, Eumolpus, Musæus, and other legendary singers of prehistoric Greece, Orpheus is supposed to have been "the pupil of Apollo and the Muses," and to have first composed certain hymns and songs used in the worship of a Dionysius, dwelling in the infernal regions, and in the initiations into the Eleusinian mysteries. A mere "abstraction," as it were, he was called the first poet of the heroic age, and though not mentioned before Ibycus, Pindar, Hellanicus, and the Athenian tragedians, he was yet placed anterior to both Homer and Hesiod. The fragments current under his name were first collected at the time of the Pisistratidæ, chiefly by Onomacritus, and these fragments grew under the hands of the Orphic brotherhood, aided by the Pythagoreans, to a vast literature of sacred mythological songs sung at the public games, chanted by the priests at their service, worked out for dramatic and pantomimic purposes by the dramatists, commented upon, philosophized upon, and "improved" by grammarians, philosophers, and theologians. Although authorities like Herodotus and Aristotle had already combated the supposed antiquity of the so-called Orphic myths and songs of their day, yet the entire enormous Orphic literature which had grown out of them retained its "ancient" authority, not only with both the Hellenists and the church fathers of the 3d and 4th centuries A.D. (who, for their individual, albeit opposite purposes, referred to it as the most authentic primitive source of Greek religion, from which Pythagoras, Heracleitus, Plato had drawn their theological philosophy), but down almost to the last generation, when it was irrefutably proved to be in its main bulk, as far as it has survived, the production of those very third and fourth centuries A.D., raised upon a few scanty, primitive snatches. The most remarkable part of the Orphic literature is its theogony, which is based mainly on that of Hesiod, with allegorizing and symbolizing tendencies, and with a desire to simplify the huge Olympic population by compressing several deities into a single one. See THEOGONY. Yet there is one figure which stands out here prominently—viz., Zagreus, the horned child of Zeus by his own daughter Persephone, who, killed by the Titans at the bidding of Here, is reborn by Semele as Dionysius.

Besides the fragments of the Theogony which have survived, imbedded chiefly in the writings of the Neoplatonists, are to be mentioned the *Argonautica*, a poem of the Byzantine period, consisting of 1384 hexameters; further, a collection of 87 or 88 liturgical hymns; a work on the virtues of stones, called *Lythica*, etc. Other poems belonging to the Orphic cycle, of which, however, only names have survived in most instances, are *Sacred Legends*, ascribed to Cercops; a poem on nature, called *Physica*, probably by Brontinus; *Bacchica*, supposed to be written by Avignota, the daughter of Pythagoras; *Minyas*, or Orpheus's descent into the Hades; and other poetical productions by Zopyrus, Timocles, Nicias, Persinus, Prodicus, etc. The best edition of the Orphic fragments is that of G. Herrmann (Leipzig, 1805). The hymns have repeatedly been translated into English by T. Taylor and others. See Lobeck's *Aglaophamus* (1829); Gerhard, *Orpheus und die Orphiker* (1861); and Schuster, *De Theogoniæ Orphicæ Indole* (Leip. 1869).

ORPIMENT. See ARSENIC.

ORR, HUGH, 1717–98; b. Scotland; son of Robert of Lochwinoch, Renfrewshire, went to the United States in 1740, and settled in June in Bridgewater, Mass., where he plied his trade of gunsmith and the manufacture of scythes and other agricultural implements. He is said to have made the first muskets ever made in this country, having a contract from the state, about 1748, to furnish 500. During the revolutionary war he made the cast-iron and brass cannons and cannon balls for the government. He invented

several machines, among them one to clean flax-seed by a new process, which he sent to Scotland. He represented his district in the state senate, and had a son, Col. Robert Orr, who was a maker of arms at Springfield, Mass.

ORR, James Lawrence, 1822–73; b. S. C.; educated at the university of Virginia, and read law, the practice of which he began at Anderson, S. C. He was a member of the state legislature 1844–45, and of congress 1848–59; and he was elected speaker of the 35th congress. He was a member of the South Carolina convention which resolved on secession in 1860, and the same year was a commissioner sent by that state to come to an arrangement with the national government in regard to the federal property in South Carolina. He was a member of the confederate senate from 1862 till the close of the war, when he accepted from the U. S. government the position of provisional governor of his native state. Adhering henceforth to the republican party, he was appointed a circuit judge in 1870, and minister to Russia in 1873. He died in St. Petersburg.

ORRERY, a machine constructed for the purpose of exhibiting the motions of the planets round the sun, and of the satellites round their primaries, which was in high repute during the 18th and beginning of the 19th centuries, though now regarded as a mere toy. It was a combination of the old *Planetarium* (q.v.), with other machines which showed the motions of the earth, moon, and planetary satellites. Though the construction of a machine which would exhibit accurately the motions, distances, and magnitudes of the planets is impossible, yet an orrery is in some degree useful as giving a general notion of the way in which the planetary motions are performed. As it was a favorite machine at one time, a description of it may not be uninteresting. A number of iron tubes equal in number to the planets, and of different dimensions, are placed one within the other; their lengths being arranged so that the innermost tube projects at both ends beyond the one next to it, that one similarly projects beyond the third, and so on. At one end of each tube a rod is fixed at right angles, and a ball or lamp attached to its end; the lengths of the rods being proportional (or at least supposed to be so) to the radii of the planetary orbits. The other ends of the tubes form the axes of toothed wheels, which are connected either directly, or by means of combinations of toothed wheels, with a winch. The several combinations of wheels are so adjusted that the velocity of revolution of the rods is proportional to the times of revolution of the planets. On turning the winch the whole apparatus is set in motion, and the balls or lamps (representing the planets) revolve round the center, which is a fixed lamp (representing the sun), at different distances, and with varying velocities. There are many nice arrangements, such as for producing elliptic motion, but these need not be described.

ORRERY, Earls of. See Boyle.

ORRIS ROOT (probably a corruption of *Iris* root), the rootstock (*rhizome*) of certain species of *Iris* (q.v.), natives of the s. of Europe, belonging to the division of the genus having bearded flowers, sword-shaped leaves, and scapes taller than the leaves; viz., *I. Florentina*, a species with white flowers; *I. pallida*, which has pale flowers; and *I. Germanica*, which has deep purple flowers. The flowers of all these species are fragrant. *I. Germanica* extends further north than the other species, and its root is sometimes said to be more acrid. Orris root was formerly used in many medicinal preparations as a stimulant, but is now almost entirely disused. It is sometimes chewed to sweeten an offensive breath. Its chief use is in perfumery. It has a pleasant smell of violets, which it acquires in drying. Hair and tooth powders, and oils, are often scented with it. A tincture of it is also used as a scent, and is often sold as *essence of violets.*

ORSAY, Alfred Guillaume Gabriel, Comte d'. See D'Orsay.

ORSINI, an Italian family holding a conspicuous position among the nobility of Italy from the 12th c. to the present time. The first of note was Giordano, a soldier, who was made cardinal in 1145 and sent as papal legate to Germany; while Matteo, his nephew, was prefect at Rome. Later, the senators Orso and Matteo, called the great, and Pope Celestine III. were members of the family. In 1277 Giovanni, son of Matteo, became pope as Nicholas III., and by his influence the rank and fortunes of the Orsini were greatly increased. They became rivals of the Colonnas, and in the contests of the Guelphs and Ghibellines sided with the former. The stronghold of the family was on lake Bracciano. Pope Alexander VI. hated both the Orsini and Colonna, and by his order in 1505 Francis Orsini, duke of Gravina, and Paolo Orsini were seized and strangled at Sinegaglia by Cesare Borgia, while the cardinal was poisoned at Rome. The branches of the family have died out with the exception of the Neapolitan Orsini-Gravina branch. The old Orsini palace at Naples is built on the ruins of the ancient theater of Marcellus; and that belonging to the modern family at Naples is one of the finest buildings in the city. Pope Benedict III., 1724, was a member of this branch of the family. Prince Domenico Orsini, duke of Gravina, 1790–1874, was lieut.-gen., senator of Rome, and assistant-prince of the holy see. His son, Filippo, duke of Roccagorsa, is the present representative of the family.

ORSINI, Felice, an Italian revolutionist, who is destined to be remembered for his atrocious attempt on the life of the French emperor, Napoleon III., was b. at Meldola, in the states of the church, in 1819. The son of a conspirator, Orsini at an early age was initiated into secret societies, and before he had reached his twentieth year he was

thrown into prison, and condemned to the galleys for life. The amnesty of Pius IX. (1846) restored him to liberty, but he was soon after again imprisoned for participation in political plots. When the revolution of 1848 broke out Orsini was elected as a deputy to the Roman constituent assembly. He was invested with extraordinary powers, and sent to Ancona and Ascoli to suppress brigandage. He signalized himself by the violence with which he executed his commission. He also took part in the defense of Rome and Venice; agitated in Genoa and the duchy of Modena; and in 1853 was shipped for England by the Sardinian government, where he formed close relations with Mazzini. Furnished with money by the leaders of the revolutionary party, he appeared at Parma in 1854, and afterwards at Milan, Trieste, Vienna, everywhere agitating in the interest of insurrection; until at last he was arrested and confined in the fortress of Mantua. In 1856 he succeeded in making his escape, and found refuge in England, where he supported himself by public lecturing, and wrote a book entitled *The Austrian Dungeons in Italy* (Lond. 1856). Towards the end of 1857 he repaired to Paris, with the intention of assassinating Louis Napoleon, whom he reckoned the great obstacle to the progress of revolution in Italy. His associates in this diabolical design were persons named Pieri, Rubio, and Gomez. Providing themselves with bombs, they took up their station in a house close by the opera, and on the evening of Jan. 14, 1858, just as the carriage containing the emperor and empress was drawing up, they threw three of the deadly missiles under the carriage. An explosion took place, and several people were wounded, one or two mortally, but their majesties remained unhurt. The assassins were arrested, tried, and sentenced; Orsini, Pieri, and Rubio to capital punishment, Gomez to hard labor for life. Rubio's life was spared at the intercession of the empress, but Pieri and Orsini were beheaded on March 13.

ORSOVA, the name of two towns at the iron gate of the Danube (q. v.). Old Orsova, a Hungarian place, is on an island, and is a station for the Danube steamers. Pop. comm. 1200.

ORTELIUS, or **ORTEL**, or **OERTEL**, Abraham, 1527–98; b. and d. Antwerp; of almost equal rank with Mercator as a geographer. He was the author of the first modern atlas, *Theatrum Orbis Terrarum*, 1570, which, notwithstanding its many defects, is a noble and wonderful work. His other productions were: *Synonymia Geographica*, a critical estimate of ancient geography; *Thesaurus Geographicus*, *Itinerarium per Nonnullas Galliæ Belgicæ Partes*, and *Deorum Dearumque Capita* Philip II. recognized his merits, and appointed him royal cosmographer, 1575.

ORTH, Godlove Stoner, b. Penn., 1817; a graduate of Pennsylvania college, Gettysburg; studied law, and commenced practice in Indiana in 1839. He represented his district in the state senate for 6 sessions, and was elected president of that body for one year. In the war of the secession he was capt. of a company on board the ram *Horner* in an engagement on the Ohio river in 1862. In 1863 he was elected member of congress from Indiana, serving 12 years, and resigned his seat to accept the mission to Austria. On May 24, 1876, he resigned his position abroad, and in August of the same year declined the nomination for governor of Indiana. He d. 1882.

ORTHAGORISCUS, a genus of plectognathous fishes. See Sun Fish.

ORTHO'CERAS (Gr. straight horn), an extensive genus of cephalopodous mollusca, found in the Palæozoic rocks from the lower Silurian to the Trias. It is nearly allied to the nautilus, and is, indeed, in its simplest forms, nothing more than an unrolled and straightened nautilus. The shell is straight, the siphuncle central, and the body chamber small. The members of the genus are the most widely distributed, and the most abundant of any of the Palæozoic fossils. Nearly 200 species have been described, but a considerable number of these have been separated into sub-genera, characterized chiefly by the form and size of the siphuncle. See illus., Silurian and Devonian Fossils, vol. XIII.

ORTHODOXY (Gr. *orthos*, right, and *doxa*, an opinion), a name given by theologians to religious opinions in agreement with Scripture, or rather with the view of Scripture entertained either by the church in general, or by the established church of any particular nation. Its antithesis is Heterodoxy (Gr. *heteros*, another, meaning "wrong," and *doxa*, opinion).

ORTHO'EPY (Gr. correctness or propriety of speech), a branch of grammar that treats of the right pronunciation of the words of a language.

ORTHOGRAPHY (Gr. correct writing), a branch of grammar that treats of the elementary sounds of a language, the signs or letters by which they are represented in writing, and the combinations of these signs to represent words; it also includes the right dividing of words into syllables (as when a word has to be divided at the end of a line), and punctuation. In a more restricted sense, orthography is synonymous with the art of correct spelling. No part of grammar is less satisfactory than this. All alphabets were from the first both defective and redundant, and therefore inadequate to represent exactly the elementary sounds of the languages to which they were applied (see Alphabet, Letters, and Articulate Sounds). The first attempts, then, at writing any language must have exhibited great diversity of spelling. Wherever an extensive literature has sprung up among a people, and language been made a study of itself, there a greater or less uniformity of spelling has, by tacit convention or otherwise, become established

for a time. Such was the case with Latin in the time of the Cæsars, with high German about the 12th and 13th centuries, and with English (Anglo-Saxon) in and for some time after the days of Alfred. But although language, as depicted to the eye, may be fixed for a time, the spoken tongue, being a living organism, cannot be thus petrified. A written literature may modify, and in some degree retard, but cannot altogether arrest that incessant change and evolution to which all spoken tongues are subject. The breaking up of the Anglo-Saxon in its transition into modern English brought necessarily a period of orthographic chaos. Never was the lawlessness greater than during one of the brightest periods of the literature, namely, the Elizabethan period. Then, and for a long time after, all perception of the real powers of the letters seems to have been lost, and nothing but caprice ruled. Not only were words spelled differently by different persons, but even among the best-educated classes the same person would spell the same word (even his or her own name) half-a-dozen ways in the same page. Among the classic writers of the Queen Anne period, some degree of uniformity began to establish itself, and this was afterwards further confirmed and fixed by the publication of Johnson's Dictionary, since which time the alterations have been comparatively trifling. The modern spelling thus established conformed itself only partially to the changes the spoken language had undergone. Of the letters that had become silent through the wearing away and collapse of the spoken words, some were omitted and others retained, with little attention to consistency, or to any principle now discernible. Hence, in the English language as now written and spoken, there is in general so imperfect a correspondence between the sound of a word and the sounds of the several letters that are written to represent it, that the spelling of each individual word has, in a manner, to be learned by itself. By no possible rules can a learner be taught when he sees the groups of letters *n-o-w*, *p-l-o-u-g-h*, *e-n-o-u-g-h*, to make out the sounds or spoken words that these groups actually represent; or, conversely, when he hears the words spoken, to find out what letters they are to be represented by. This circumstance presents great difficulty to foreigners in the acquisition of English; which, in other respects, is one of the simplest and most easily learned languages in the world. The orthography of English is only to be acquired by observation and practice. See PHONETIC WRITING.

ORTHOGRAPHY, FIGURES OF, are derivations from the ordinarily accepted spelling of words. They are three in number; archaism, crasis, and mimesis. *Archaism* consists in spelling words according to a usage which is ancient or obsolete, as if one should write, "The *gret Kyng hathe* fifty fair *damyselles alle maydenes.*" So Vergil has *olli* for *illi*, Horace *duellum* for *bellum*. *Crasis* (Gk., a mixing) in Greek grammar denoted the mixing of two words by the coalescence of their final and initial vowels, into one long syllable. Thus *ta auta* becomes *taùta*. The occurrence of crasis is indicated by the *coronis* (') placed over the vowel or diphthong of the resulting long syllable. In Latin grammar, the term crasis was applied to the union of any two vowels into a long vowel or diphthong, and so became synonymous with contraction. Examples of crasis in Latin are *cogo* (= coago), *nil* (= nihil), *cors* (= cohors).

Mimesis (Gk., imitation) consists in the representation of the improper pronunciation of words by means of false spelling. Mimesis is common in works which profess to represent the speech of the illiterate, or whose characters use dialectical forms, or which represent negro speech.

ORTHOPÆDICS. Relating to the science of correcting deformity in children.

ORTHOP'TERA (Gr. straight-winged), an order of mandibulate insects, in many respects resembling the *coleoptera* (q.v.), but having the wing-covers softer and generally leathery and flexible. The wing-covers also often overlap on the back when at rest, or meet at an angle, like the roof of a house. The wings are broader than the wing-covers, and fold in a fan-like manner. A few species are wingless. The body is generally elongated. The antennæ are almost always filiform and many-jointed. The eyes are usually very large, and there are also in most species two or three stemmatic eyes. The mouth much resembles that of the coleoptera, but the maxillæ are terminated by a horny denticulated piece, and covered by a *galea;* and the interior of the mouth exhibits a distinct fleshy piece, which some regard as a kind of tongue. The orthoptera undergo only a semi-complete metamorphosis, the larva and pupa much resembling the perfect insect, except in the want of wings; which, however, begin to be developed in the pupa. The earwig family differs so much from the other orthoptera as to have been constituted by some entomologists into a distinct order. See EARWIG.

OR'TOLAN, *Emberiza hortulana*, a species of bunting (q.v.), much resembling the yellow-hammer, and not quite equal to it in size. The adult male has the back reddish-brown, the wings dusky black and rufous brown; the tail dusky black, some of the outer tail-feathers with a patch of white on the broad inner web; the chin, throat, and upper part of the breast yellowish-green; the other under parts reddish buff-color. The plumage of the female is of less vivid hues. The ortolan occurs in great flocks in the south of Europe and north of Africa. Even in the south of Europe it is a summer bird of passage, but its migrations extend as far north as Lapland, although in Britain it is a very rare bird, and only of accidental occurrence. It has no song, but merely a monotonous chirping note. It frequents bushy places, but often makes its nest on the ground in corn-fields, particularly where the soil is sandy. No bird is so highly esteemed by epicures, and vast numbers are used for the table. It is taken chiefly by nets.

ORTON, JAMES, 1830–77, b. N. Y., graduated at Williams college, 1855, and then studied theology at the Andover seminary. In 1860 he returned from an extended trip through Europe and Palestine, and was ordained a Congregational minister. He became professor of natural sciences in Rochester university in 1866, and in the next year took charge of a scientific expedition across South America which found many fossils and specimens of value in the Amazon valley, and in 1873 made a second expedition to Lima and lake Titicaca. From 1869 to the time of his death Prof. Orton was professor of natural history in Vassar college. He published *The Miner's Guide and Metallurgist's Directory* (1849); *The Proverbialist and Poet* (1852); *Andes and the Amazon* (1870); *Comparative Zoölogy* (1875.)

ORTO'NA, a town of e. Italy, on the Adriatic, in the province of Chieti, 12 m. e. by s. of the town of that name. It gives title to a bishop, and contains a cathedral and other religious edifices. Its port has ceased to exist, and vessels are now obliged to anchor about a mile from the town in unsheltered roads, where, however, the water is deep and the bottom good. Wine is extensively grown, and has a local reputation as the best in this part of Italy. Pop. 7,000.

ORTY'GIA. See DELOS.

O'RTYX. See VIRGINIAN QUAIL.

ORU'RO, a department in w. Bolivia adjoining Peru, between the e. and w. ranges of the Andes, watered by the Desaguadero river; 21,331 sq. m.; pop. '93, 189,840. The surface is undulating, consisting mostly of a great plain called the valley of the Desaguadero. The soil is fertile; the principal productions are quinine and potatoes. Vineyards flourish in the valleys, producing a good quality of wine. Cattle, sheep, llamas, alpacas, vicuñas, etc., are numerous. There are rich mines of tin and salt; and gold exists in some parts. Large quantities of silver are found, especially in the mines of Popó, Cerro de Oruro, and El Turco. The climate is even, though great storms occur in the wet season. The Desaguadero, which rises in lake Titicaca, empties into lake Aullagas, which is without outlet.

ORU'RO, or, in the complete form of the name, *San Felipe de Asturia de Oruro*, a town of Bolivia, the capital of the department of Oruro. It is situated about 9 m. e. from Desaguadero, and 32 m. n. from the northern extremity of the salt lake of Desaguadero, on an affluent of the river of the same name which falls into that lake. It is 12,117 feet above the level of the sea, at the base of a very high mountain; but on the other side of the town is a large plain, often covered with saline efflorescences. The soil of the whole department is saline, and far from being fertile, but its mineral wealth is great. Gold, silver, copper, tin, iron, lead, and antimony are among its products. Oruro was founded in 1590, in consequence of the discovery of silver mines, which proved more productive than any in Bolivia, except those of Potosi. It soon became a wealthy and flourishing city with 70,000 inhabitants; but in consequence of the diminished productiveness of its mines, and of the anarchy prevailing in the country after the revolution, its population declined, and is now only 8500. It has recently been made the seat of the Bolivian government, and the place of meeting of congress.

ORVIET'O, a city in the province of Umbria (Perugia), which was included in the former Papal States, but now forms part of the kingdom of Italy, stands on the right bank of the Paglia, 26 m. n. of Viterbo, and 60 m. n.n.w. of Rome. It occupies a strong position on a steep hill, is well built, and is surrounded with walls. It has been the seat of a bishop since 509 A.D. The cathedral, a beautiful specimen of the Italian Gothic, and one of the most richly-decorated edifices in Italy, is built of black and white marble, was begun in 1280, and completed about the middle of the 14th century. The façade is unsurpassed in richness of material, and in the beauty of its mosaics, sculptures, and elaborate ornamentation. The interior is also magnificently decorated with sculptures and paintings. The other chief buildings are St. Patrick's Well, and several palaces. Pop. 7900, who trade in corn, cattle, and silk, and a delicate white wine, which is highly esteemed at Rome.

Orvieto, called in the time of the Longobards *Urbs Vetus*—of which its present name is a corruption—has been the place of residence and retreat in turbulent times of upwards of 30 popes. The city is evidently of Etruscan origin, but of its early history nothing is known.

ORYCTEROPI'DÆ. See AARD-VARK.

O'RYX, the name given by the ancients to a species of antelope, a native of the n. of Africa. It is often represented on the monuments of Egypt, and as these representations are most always in profile, it is generally made to appear as having only one horn, thus probably contributing to the fable of the unicorn; and indeed, all the older figures of the unicorn exhibit a considerable resemblance to this kind of antelope. The name *Antilope oryx* was given by Pallas to the Gems-boc (q.v.), an antelope certainly much resembling the oryx, but found only in South Africa; and it is now generally believed that the true oryx of the ancients is a species also known as the ALGAZEL (*Antilope Gazella* or *Oryx bezoartica*), common in the n. of Africa.

ORY'ZA. See RICE.

OSA'CA, or Ozaka, a city of Japan, in n. lat. 35° 5′, about 20 m. from its seaport of Hiogo, is situated on a large river on the s.e. coast of the main island, in the most central and populous part of the empire, and surrounded by the great tea districts. Osaca is one of the three imperial cities of Japan, and is a great center of trade; especially since 1863, when it became possible for foreigners to settle. The town, clean and regularly built, is intersected by numerous streams, spanned by hundreds of wooden and iron bridges. The chief public building is its castle, built in 1583. Some of the other public buildings are imposing structures, such as the municipal hall and the new mint. The latter is equipped with the finest obtainable apparatus; and of late much foreign machinery has been introduced into Osaca, to the great advancement of its manufactures. Besides very numerous Buddhist and other temples, there are in Osaca two Christian churches, a government college, an academy, and public schools. The town is connected by railway with Hiogo and Kioto (see MIAKO), 27 m. further inland. Pop. '90, 473,500.

OSAGE, a co. in e. Kansas, drained by the Osage, and by Salt and Dragoon creeks; on the Atchison, Topeka, and Santa Fé, and the Missouri Pacific railroads; 720 sq. m.; pop. '90, 25,062, chiefly of American birth. The surface is rolling, most of it prairie, and the rest covered with forests. The soil is fertile and produces good crops of corn, oats, wheat, hay, and potatoes. Many cattle are raised. Bituminous coal abounds in some parts. Co. seat, Lyndon.

OSAGE, a co. in e. central Missouri, bounded on the n. by the Missouri river, on the n. w. by the Osage river; drained by the Gasconade; on the Missouri Pacific railroad; 586 sq.m.; pop. '90, 13,080, chiefly of American birth. The surface is diversified and hilly, and the soil mostly fertile. The principal productions are corn, oats, wheat, tobacco, and hay. Co. seat, Linn.

OSAGE ORANGE, *Maclura aurantiaca*, a tree of the natural order *Moracæ*, a native of North America. It attains a height varying, according to soil and situation, from 20 to 60 feet. It is of the same genus with Fustic (q.v.), and its wood, which is bright yellow, might probably be used for dyeing. The wood is fine-grained and very elastic, and is much used by the North American Indians for making bows. The osage orange has been successfully used in many places as a hedge plant. Its fruit is about the size of a large orange, has a tuberculated surface of a golden color, and is filled internally with radiating somewhat woody fibers, and with a yellow milky juice, the odor of which is generally disliked, so that the fruit, although not unwholesome, is seldom eaten.

OSAGE RIVER, rises in Wabaunsee co., Kansas, flows e. and then s.e. into Missouri, passes through Bates, St. Clair, Benton, Camden, and Miller counties, and after a course of about 500 m., empties into the Missouri river 9 m. s. of Jefferson. That part of it which intersects Kansas and w. Missouri is often called the *Marais des Cygnes*. It is navigable for the lower 200 m. of its course.

OSAGES, a tribe of Dakota Indians, the most powerful and warlike of the eight tribes of southern Sioux, who in 1673 were found by Marquette on lands watered by the Missouri and its tributaries. They were confederates of the Illinois, but were forced to abandon their settlement in 1700, and settled in Arkansas. They fought with the French against the Foxes at Detroit in 1712, and the visit of some of their chiefs soon afterwards to France augmented their friendship, whereupon they became allies of the French against the Chickasaws, and against the English in their last battles. About 1800 they were at war with the Sacs and Foxes, but peace was established in 1804. At this time most of the Great Osages were living in the region of the Arkansas, their chief being Big Track, and the Little Osages had left the Missouri and settled on the Great Osage river, their total number at this time being 6,300. A treaty was made with the chief of the Big Osages and the chiefs of the Arkansas, and the Little Osages in 1808, in which they ceded a part of their land to the United States. The Osages afterwards disputed the authority of this treaty, and caused great disturbance by constant plundering. Their time was spent in warring with the neighboring tribes, and, in an encounter with the Cherokees in 1817, Clermont, chief of the Arkansas Osages, was killed, and his town laid waste. Other treaties ceding lands were made in 1815, 1818, 1822, and 1825. A mission which had been established among them by the American Board was discontinued in 1845, and a Jesuit mission was begun a year later, but the attempts to introduce Christianity were futile. They have always been a thieving, plundering tribe, showing little inclination for agricultural pursuits. They were removed in 1870 to their reservation, comprising 1,760,000 acres, partly bounded on the s. and w. by the Arkansas river, and w. of long. 96°. It is mostly a hilly country, with little fertile land. About 2,000 acres are said to be under cultivation. A school has been established among them, but they are not desirous of education. They now number, 1890, 1509.

OSBORN, SHERARD, 1822–75; b. England; entered the British navy in 1837, and soon rose to a captaincy. He commanded the *Pioneer*, which was sent in search of sir John Franklin, and took part in the Crimean war. He did efficient work in the Chinese waters, having been placed in command of a squadron by the emperor of China in 1862, to suppress piracy. He returned to England in 1864, and was placed in command of the armor-plated *Royal Sovereign*, in order to test the turrets which had been constructed

on a new principle by Capt. Cole. In 1873 he became rear-admiral. He has written some interesting books entitled, *Stray Leaves from an Arctic Journal; A Cruise in Japanese Waters; The Career, Last Voyage, and Fate of Sir John Franklin; The Past and Future of British Relations in China;* and *Japanese Fragments.*

OSBORNE, a co. in n. Kansas, drained by Wolf and Salt creeks, and the North and South forks of the Solomon river; 900 sq.m.; pop. '90, 12,083 inclu. of American birth. The surface is undulating and mostly prairie, and the soil is fertile. Limestone abounds. Co. seat, Osborne.

OSBORNE, or St. Helen's Beds, are a series of strata of the middle eocene period, occurring in the isle of Wight. They have been divided into two groups: 1. The St. Helen's sands, consisting of layers of white, green, and yellow sands, interstratified with blue, white, and yellowish clays and marls, with a maximum thickness of 50 feet; and, 2, the Nettlestone grits, composed of yellow limestone and marl, and a shelly freestone, which is much used for building, having a maximum thickness of 20 feet. The fossils of the Osborne beds are species of paludina and cypris, and the spirally sculptured spore-cases of chara. The group is of fresh and brackish water origin, and is very variable in mineral character and thickness.

OSBORNE, Lord Sydney Godolphin, b. England, 1808; third son of the first lord Godolphin. He was educated at Oxford; was for a number of years rector of Stoke Pogis, and rector of Durweston 1841–75. He has published *Gleanings in the West of Ireland* (1850); *Lady Eva: Her Last Days* (1851); *Scutari and its Hospitals* (1855); *Hints to the Charitable, and Hints for the Amelioration of the Moral Condition of a Village* (1856); *Letters on the Education of Young Children* (1866); and numerous pamphlets on the means of improving the homes of the laboring classes. D. 1889.

OSBORNE, Thomas O., b. Ohio, 1832; a graduate of Ohio university, Athens, Ohio, class of 1854; went to Crawfordsville, Ind., studied law, was admitted to the bar, and in 1858 commenced practice in Chicago. In the war of the secession he was col. of the 39th Illinois volunteers, commissioned in Dec., 1861, and was in action at the battle of Winchester in 1862. In 1863 he participated in the operations in Charleston harbor, commanded by Admiral Dupont, and in May, 1864, went up the James river with Gen Butler, on the Dutch gap expedition. At the battle of Drury's bluff he lost his right arm. He commanded the 1st brigade, 1st division, 24th corps, at the close of the siege of Petersburg, conducted by Gen. Grant, and, on April 2, 1865, captured fort Gregg by a gallant charge, securing an important outpost of the fortifications raised around Petersburg and Richmond, cutting off the advance of the confederates on the Lynchburg road, which was the beginning of the capture of Lee's army. In acknowledgment of this service he was promoted to brig.-gen., and was brevetted maj.-gen. After the war he returned to the practice of law in Chicago, and was U. S. consul-general and minister-resident to the Argentine Republic in 1874–85.

OSCAR I., Joseph-Francis, king of Sweden and Norway, was b. at Paris, July 4, 1799, and was the only issue of the marriage of Charles XIV. (q.v.), formerly marshal Bernadotte, with Desirée Clary, the daughter of a Marseillais merchant, and sister of madame Joseph Bonaparte. After the election of his father as crown-prince of Sweden, Oscar received the title of duke of Sudermania, and was placed under the tutelage of the poet Atterbom, for the purpose of acquiring the Swedish language. In 1818 he entered the university of Upsala, where his education was completed. The effects of the thorough training he received were seen in his remarkable proficiency in science, literature, and especially the fine arts. For some time he gave himself up almost entirely to the study of music, and composed various pieces, including an opera, and several waltzes, marches, etc.; he is also the author of several songs and hymns, some of which are still popular. He also published memoirs on education and penal establishments. What is of more consequence, he became thoroughly imbued with the national sentiments, and after his admission to a share in the administration, opposed, though with becoming filial respect, the pro-Russian policy of his father. This course of conduct rendered him immensely popular, and on March 8, 1844, his accession to the throne was hailed with rapture by the great majority of his subjects. His rule was distinguished for its liberality and justice; and many liberal measures, such as those for the removal of Jewish disabilities, freedom of manufactures and commerce, and parliamentary reform (the last-mentioned being vigorously opposed by the nobility), were laid before the *riksdag* by his orders. He introduced these changes with caution and gentleness, and had the gratification of seeing, in most cases, his prudence crowned with success. His foreign policy was of an independent and anti-Russian character, and during the Crimean war he joined (Nov. 21, 1855) the king of Denmark in a declaration of armed neutrality, which gradually assumed a more hostile attitude to Russia, and would have inevitably led to war, had not the Paris treaty so rapidly succeeded. His attitude at this time gained him general favor and respect throughout Europe. On July 19, 1823, he married Josephine Beauharnais, the granddaughter of the empress Josephine, by whom he had five children, the eldest of whom, on account of his father's failing health, was appointed regent, Sept. 25, 1857, and succeeded to the throne as Charles XV. on the death of Oscar, July 8, 1859. Charles XV. died Sept. 18, 1872.

OSCAR II., King of Sweden and Norway, b. 1829; married, in 1857, princess Sophia, daughter of duke Wilhelm of Nassau, by whom he has four sons, of whom the eldest, Gustaf, duke of Göthland, was b. in 1858. King Oscar held the rank of lieut.-gen. in the army when he ascended the throne in 1872, in succession to his brother, Charles XV. He was crowned in the cathedral at Drontheim in 1873. He has followed the liberal policy of his predecessor, enlarged the liberty of the press, and made many reforms. In 1878 he was elected a corresponding member of the Frankfort Academy of Sciences, on account of his Swedish translation of Goethe's *Faust*. He published five volumes of writings and speeches, the last in 1894.

OSCEO'LA (Seminole, *As-se-ho-lar*), a chief of the tribe of Seminole Indians in Florida, United States, was b. about 1803. He was the son of an English trader, named Powell, and the daughter of a Seminole chief. In 1835 the wife of Osceola, a chief's daughter, was claimed and seized as a slave by the owner of her mother. The outraged husband threatened revenge, and for his threats was imprisoned six days in irons by Gen. Thompson. Lying in wait, a few days afterwards he killed the general and four others. This was the beginning of the second Seminole war. Laying an ambush soon after, he killed Maj. Dale and a small detachment of soldiers; and, taking to the almost impenetrable Everglades, with two or three hundred followers, he fought for a year with great energy and skill the superior numbers sent against him. He was taken prisoner at last by Gen. Jessup, while holding a conference under a flag of truce, an act of inexcusable treachery, though represented as one of retaliation, and confined in Fort Moultrie until his death in Jan., 1838.

OSCEOLA, a co. in south-eastern Fla., formed 1887, from parts of Orange and Brevard, bordered on the west by lakes Tohopekaliga and Kissimmee and Kissimmee river; 1758 square miles; pop. '90, 3133. The surface is level for the most part, and the soil rich. Stock-raising and the cultivation of sugar-cane are important industries. Co. seat, Kissimmee.

OSCEOLA, a co. in n.w. Iowa, having the state line of Minnesota for its n. boundary; 408 sq.m.; pop. '90, 5574, chiefly of American birth. It is drained by Little Sioux river, Otter creek, and Rock river, an affluent of the Big Sioux, and is intersected by the Chicago, St. Paul, Minneapolis and Omaha railroad. Its surface is generally level, a large proportion fertile prairie land, and containing unbounded agricultural resources undeveloped. Co. seat, Sibley.

OSCEOLA, a co. in central Michigan, intersected by the Flint and Père Marquette, and the Grand Rapids and Indiana railroads, forming a junction in the s.w. section; 580 sq. m.; pop. '90, 14,630, chiefly of American birth, includ. colored. It is drained by the Muskegon and Pine rivers, and other affluents of the Manistee river. Its surface is hilly, a large proportion covered with a dense growth of timber, and trade in lumber is active. Co. seat, Hersey.

O'SCHERSLEBEN, or Gross-Oschersleben, a t. of Prussia, prov. of Saxony, on the left bank of the Bode, a branch of the Saale, 12½ m. n.e. by n. of Halberstadt. Pop. 10,500.

OSCO'DA, a co. in n. Michigan, intersected centrally by the Au Sable river; 580 sq.m.; pop. '90, 1904, chiefly of American birth. Its surface is elevated table land, uneven and largely covered with timber. It is visited in the season by large numbers of sportsmen, the Au Sable being famous for good fishing, containing the grayling, a kind of salmon with a very small mouth, found in the streams of England, Sweden, Norway, and Lapland, considered delicious food. Its soil is fertile, easily cultivated, and adapted to the production of grain and potatoes. Lumber is the chief article in trade. Co. seat, Mio.

OS'CI, originally Opsci (rendered by Mommsen "laborers," from *opus*, a work), in Greek always Opikoi, the name of an Italian people, who at an early period occupied Campania, and were either closely allied to or the same race as the Ausones. Subsequently (about 423 B.C.) Samnites from the hilly districts to the north overran the country, and amalgamated with the inhabitants whom they had subjugated. It is conjectured that the conquerors were few in numbers, as (like the Normans in English history) they adopted, in time, the language of the conquered, but whether they modified the original Oscan language, and, if so, to what extent, cannot now be ascertained. As it was these Samnitic Oscans or Campanians who formed that Samnitic people with whom both the Greeks of lower Italy and the Romans first came into contact, the names *Osci* and *Oscan language* were subsequently applied to all the other races and dialects whose origin was nearly or wholly the same. The Oscan language was not substantially different from the Latin, but only a ruder and more primitive form of the same central Italic tongue. The territory where it was spoken comprised the countries of the Samnites, Frentani, northern Apulians, Hirpini, Campani, Lucani, Bruttii, and Mamertini, whose dialects only slightly differed from each other; besides the entire Samnitic races, whence the language is sometimes called Samnitic or Safinic. The races situated n. of the Silarus were purely Samnitic; those s. of it, and even of the region round the gulf of Naples, were Græco-Samnitic. The use of the national Samnitic alphabet was confined to the former. By the victories of the Romans over the Samnites, and the conferring of the *civitas* on all the Italians (88 B.C.), an end was put to the official use of the Oscan

tongue; nevertheless, in the time of Varro (1st c. B.C.) it was still used by the people, and as late as the destruction of Herculaneum and Pompeii was spoken by a few individuals. During its most flourishing period it was something more than a country *patois;* it is even possible that the Oscans had a literature and art of their own, which may not have been without influence on the early Calabrian poets Ennius and Pacuvius, and the Campanian Lucilius. At any rate, we certainly know of a poetic creation peculiar to the Campanians, a kind of unwritten, regular, probably improvised farce, with fixed parts and changing situations, which was transplanted to Rome about 304 B.C., but was imitated there not in Oscan but in Latin. See ATELLANÆ. Besides a considerable number of coins with Oscan legends, there are still extant a number of inscriptions in the Oscan tongue, among which the most important for linguistic purposes are: 1st, the *Tabula Bantina,* a bronze tablet found in the neighborhood of Bantia (on the borders of Lucania and Apulia), referring to the municipal affairs of that town; 2d, the *Cippus Abellanus,* or stone of Abella (in Campania); and, 3d, a bronze tablet found near Agnone, in northern Samnium. See Mommsen's *Oskische Studien* (Berlin, 1845), and *Die Unteritalischen Dialekte* (Leip. 1850); also Friedländer's *Die Oskischen Münzen* (Leip. 1850); Kirchhoff's *Das Stadtrecht von Bantia* (Berlin, 1853); and Donaldson's *Varronianus* (pp. 104–138).

OSCULA'TION, and OS'CULATING CIRCLE (Lat. *osculari,* to kiss). One curve is said to osculate another when several points are common to it with the other, and the degree of osculation is said to be high or low according as the number of points in contact are many or few. The number of possible points of contact is determined by the number of constants contained in the equation to the tangent curve (supposing the number of constants in the equation to the curve which is touched to be greater). The same is true of a straight line and a curve. The equation to a straight line being of the form $ax+b$, contains two constants, a and b, hence a straight line *can* coincide with a curve in *two* contiguous points, and the contact is said to be of the *first* order. This straight line is the tangent at the point of contact. When a straight line, not a tangent, meets a curve, there is no "contact" but "section," as in that case only one point is common to the straight line and the curve. The equation to a circle contains three constants, and therefore a circle *can* have *three* consecutive points in common with a curve, and the contact is then of the *second* order. This circle is known as the "circle of curvature," or the osculating circle, and has for its radius the radius of curvature of that portion of the curve with which the circle is in contact. No other circle can have so high a degree of contact with a curve at any point as the osculating circle at that point.

ÖSEL. See OESEL.

OSGOOD, DAVID, D.D., 1747–1822; b. Mass. He worked until the age of 19 on his father's farm; graduated at Harvard in 1771; studied theology with the Rev. Mr. Emerson of Hollis, and afterwards at Cambridge; was ordained in 1774; was settled as Congregational pastor at Medford for 50 years, and became a distinguished preacher. He was a zealous federalist, and in 1794 preached a sermon upon Genet's appeal to the people against the government, which attracted much attention, and passed through several editions. A volume of his *Sermons* was published in 1824.

OSGOOD, FRANCES SARGENT, 1811–50; b. Mass., and when but a girl contributed several poems to the *Juvenile Miscellany* of Lydia Maria Child. In 1835 she married Samuel Osgood, a portrait painter, and visited England, where she published a collection of poems called *A Wreath of Wild Flowers from New England* (1839); two tragedies, *Elfrida* and *The Happy Release; or, the Triumphs of Love,* and a number of contributions to periodicals. In 1840 she returned to New York and edited several illustrated gift-books, such as *The Floral Offering.* A *Memorial,* with an account of her life, by Dr. R. W. Griswold, was printed in 1851; and a complete illustrated edition of her poems was published in 1850.

OSGOOD, HELEN LOUISE (GIBSON), 1835–68; b. Mass.; one of the original organizers of the soldiers' aid societies in the war between the states; educated carefully under the supervision of F. B. Fay of Chelsea, her guardian after the loss of her parents in early childhood. In connection with her work for the soldiers, in field and hospital, she provided employment for their wives and daughters who were dependent on their own exertions. She went as nurse to the army of the Potomac in 1861 and served through the war, becoming a favorite with the sick and disabled, winning their esteem and gratitude by her kind attentions, the sweetness of her manner, and her appreciation of their needs. She established and conducted a hospital for colored soldiers, capable of accommodating 1000 cots. During the war she visited and comforted thousands of the sick, wounded, and dying. Her ceaseless labors undermined her health, and she died at her home in Newton Center, Mass.

OSGOOD, SAMUEL, 1748–1813; b. Mass.; graduated at Harvard college in 1770; studied theology, but his health failing, became a merchant, and was active in public affairs. In 1774 he was a delegate to the Essex co. convention; a member of the provincial congress, and on many important committees. In 1775 he was capt. at Lexington and Cambridge; aid to Gen. Ward in 1776; member of the board of war, and in

1776 left the army with the rank of col. and assistant commissary. He was a member of the Massachusetts legislature; delegate to the old congress in 1780–84; first commissioner of the U. S. treasury, 1785–89; postmaster-general, 1789–91. Afterward he was a member of the New York legislature and speaker of the house; supervisor of New York in 1801–03; and from 1803 naval officer of the port of New York until his death. He published several volumes on religious topics, and a work on chronology. He had an extensive acquaintance with science and literature.

OSGOOD, SAMUEL, D.D. 1784–1862; b. Maine; graduated at Dartmouth college in 1805; was pastor of the first church (Congregational), Springfield, Mass., 1809–62. As a preacher he was earnest and direct; he had great force of character, and his abilities gained extensive recognition.

OSGOOD, SAMUEL, D.D., LL.D., 1812–80; b. Mass.; graduated at Harvard college in 1832, and at the Cambridge divinity school in 1835. In 1836–37 he edited the *Western Messenger* at Louisville, Ky. In 1837 he became pastor of the Unitarian church at Nashua, N. H., in 1841 of the Westminster church in Providence, R. I., and in 1849 of the church of the Messiah in New York. In 1850–54 he was editor of the *Christian Inquirer* in New York. In 1869, resigning his pastoral charge, he went to Europe for health and rest. On his return in 1870 he entered the Protestant Episcopal church, but took no pastoral charge. He received the degree of D.D. from Harvard college in 1857, and of LL.D. in 1872 from Hobart college. For several years he was domestic corresponding secretary of the New York historical society. He was the author of *Studies in Christian Biography; The Hearthstone; God with Men; Mile-Stones in our Life-Journey; Student Life; American Leaves;* translations from Olshausen's *The History of the Passion,* and DeWette's *Human Life.* His printed sermons, speeches, and orations, are numerous. He contributed largely to the *Christian Examiner,* and wrote also for the *North American Review, Bibliotheca Sacra,* and various monthly magazines.

OSGOOD, THADDEUS, 1775–1852; b. Mass.; graduated at Dartmouth in 1803; studied theology with Drs. Lothrop and Emmons; was ordained in 1806; was stated preacher to the Congregational church in Southbury, Conn. He organized the first church of Buffalo, now Presbyterian, and many others. He visited England several times, and collected a large amount for educational purposes. He founded a society in Canada to supply Bibles for seamen and emigrants, and was engaged for many years in organizing Sunday schools.

OSGOODE, WILLIAM, 1754–1824; b. England; a graduate of Oxford in 1777. Emigrating to Canada to practice law, he became, in 1792, chief-justice of the Province of Upper Canada, and in 1794 chief-justice of the Province of Quebec. From 1801 until his death he lived in England.

OSHI'MA, a Japanese word meaning "big island," used in general to denote the larger of two neighboring islands, the smaller being called *Koshima;* more especially applied to Vries or Barneveld's island, situated near the entrance to the gulf of Yedo. This *Oshima* is 8 m. long and 5 m. wide, has a good harbor, and is remarkable for an active volcano about 2,500 ft. high, the flames from which can be seen at a great distance by sailors in the night. There are a number of villages upon the island.

OSH'KOSH, city and co. seat of Winnebago co., Wis.; on both sides of the Fox river, and on the Chicago and Northwestern, the Wisconsin Central, the Chicago, Milwaukee, and St. Paul, and the Milwaukee, Lake Shore, and Western railroads; 35 miles n.w. of Milwaukee. It contains the state normal school, public library, high school, school for the deaf and dumb, U. S. government building, court-house, city hall, two public parks, and in the suburbs the northern state hospital for the insane, and the co. hospital for the incurable insane. There are four bridges across the river, horse and electric street railroads, waterworks, electric lights, national and state banks, about 15 churches, and daily and weekly newspapers. The city was settled in 1836, and chartered in 1850, and is noted for its vast lumber interests and its manufacture of doors and sashes. The U. S. census reports of 1890 showed 423 manufacturing establishments, employing $6,461,812 capital and 5,383 persons, paying $2,019,026 for wages and $4,668,843 for materials, and having an output valued at $8,620,626. The principal products, besides those of lumber, are machinery, flour, tobacco, furniture, carriages and wagons, and packed meat. Pop. '90, 22,836.

OSIANDER, ANDREAS, one of the most learned and zealous of the German reformers, was born in 1498, at Gunzenhausen, near Nuremberg. His father was a blacksmith, called Hosemann, out of which name his son, after the fashion of his time, manufactured the classic-looking Osiander. Osiander was educated at Ingolstadt and Wittenberg, and after completing his course of study, became a preacher at Nuremberg, where he was conspicuously active in introducing the reformation (1522). He ardently advocated the views of Luther in his controversy with the Swiss reformer Zwingli, on the question of the Lord's-supper. He took part in the conference held at Marburg (1529), and was present at the diet of Augsburg (1530). In 1548 he was deprived of his office as preacher at Nuremberg, because he would not agree to the Augsburg interim; but was immediately afterwards invited by Albrecht, duke of Prussia, to become the head of the theological faculty in the newly established university of Königsberg. He was hardly settled here

when he became entangled in a theological strife that imbittered his naturally imperious and arrogant temper. In a treatise, *De Lege et Evangelio* ("On the Law and the Gospel"), Osiander asserted that the righteousness by which sinners are justified, is not to be conceived as a mere justificatory or imputative act on the part of God, but as something inward and subjective, as the impartation of a real righteousness, springing in a mystical way from the union of Christ with man. The most notable of his opponents was Martin Chemnitz (q.v.). A seemingly amicable arrangement between the disputants was brought about by duke Albrecht in 1551; but the strife was soon recommenced, by Osiander publishing some new writings in which he attacked Melanchthon; nor did his death in the following year put a stop to the war of words. It was continued by his followers, called *Osiandrists*, who were finally extinguished by the *Corpus Doctrinæ Prutenicum* (in 1567), which caused their banishment from all parts of Prussia. See Wilken, *Andr. Osiander's Leben, Lehre und Schriften* (Strals. 1844).

O'SIER (Fr. probably of Celtic origin), the popular name of those species of willow (q.v.), which are chiefly used for basket-making and other wicker-work. They are of low bushy growth, few of them ever becoming trees, their branches long and slender; and they are the more valuable in proportion to the length, slenderness, suppleness, and toughness of their branches. Their leaves are long and narrow, lanceolate, or nearly so, obscurely notched on the margin, almost always smooth on the upper side, but generally white and downy beneath. The COMMON OSIER (*salix viminalis*), a common native of wet alluvial grounds in Britain and many parts of Europe, is one of those which sometimes become trees, although when cultivated for basket-making, it is not permitted to do so. It has two distinct stamens in the flowers of the male catkins; and the stigmas of the female catkins are long and slender. It is often planted to prevent the banks of rivers from being washed away. Its branches are used for making hoops and coarse baskets. There are several varieties in cultivation, not easily distinguished except by a very practiced eye, but much more useful than the original or wild kind, which is apt to break, and therefore of little value. More suitable for the finer kinds of basket-making are *salix Forbyana*, sometimes called the FINE BASKET OSIER, and *S. rubra*, known near London as the GREEN-LEAVED OSIER or ORNARD; *S. triandra*, a triandrous species, known to English osier-cultivators and basket makers as the SPANIARD ROD; whilst *S. vitellina*, a pentandrous species, sometimes becoming a tree, is the GOLDEN OSIER or golden willow, remarkable for the bright-yellow color of its branches, as well as for their pliancy and toughness. There are other species, not natives of Britain, which are also valuable; but the osiers chiefly cultivated belong to those which have been named, or are very nearly allied to them.

Osiers are very extensively cultivated in Holland, Belgium, and France, on alluvial soils, especially near the mouths of rivers; and from these countries great quantities of "rods" are imported into Britain. They are cultivated also to a considerable extent in some parts of England, particularly on the banks of the Thames and the Severn, and in the level districts of Cambridgeshire, Huntingdonshire, etc. They are nowhere extensively cultivated in Scotland. Islets in the Thames and other rivers, entirely planted with osiers, are called *Osier holts*. Osiers grow particularly well on grounds flooded by the tide. Much depends on the closeness of planting of osier grounds; as when space is too abundant, the shoots of many of the kinds do not grow up so long, slender, and unbranched as is desirable. The French cultivators, when they wish osiers for the finest kinds of basket-work, cut branches into little bits with a bud or eye in each, and plant these pretty close together, so as to obtain weak but fine shoots; but generally cuttings of 15 or 16 in. in length are used, and of tolerably thick branches; and these are placed in rows, from 18 in. to 2 ft. apart, and at distances of 15 to 18 in. in the row. Osier plantations in light soils continue productive for 15 or 20 years, and much longer in rich alluvial soils. Osiers succeed best in rich soils, but not in clays. No cultivation is required after planting; but the shoots are cut once a year, at any time between the fall of the leaf and the rising of the sap in spring. After cutting, they are sorted; and those intended for brown baskets are carefully dried and stacked, care being taken that they do not *heat*, to which they are liable, like hay, and by which they would be rotted and rendered worthless. The stacks must be carefully protected from rain. The osiers intended for white baskets cannot at once be peeled; but after being sorted, they are placed upright in wide shallow trenches, in which there is water to the depth of about 4 in. or in rivulets, being kept secure in their upright position by posts and rails; and thus they remain till they begin to bud and blossom in spring, which they do as if they remained on the parent plant, sending forth small roots at the same time into the water. They are then, in ordinary seasons, easily peeled by drawing them through an instrument called a *break*, but in cold springs it is sometimes necessary to lay them for a while under a quantity of litter. After being peeled, they are stacked, preparatory to sale.

It is impossible to form an estimate of the quantity produced in Great Britain, but her imports amount annually to about 200,000 bundles; nearly one-half are from Holland, and the remainder from the Hanse towns, Belgium, and France.

OSI'MO (the ancient Auximum), a t. in the province of Ancona, Italy; 8 m. from Ancona on the road to Loretto; pop. about 7,000. It has a cathedral, an episcopal palace, a museum containing many statues and ancient inscriptions found near by, and

several churches containing noteworthy paintings. Auximum was made a Roman colony in B.C. 157, and in the wars of Pompey and Cæsar was occupied by both parties at different times.

OSI'RIS, according to others, *Asiris*, or *Hysiris* ("Many-eyed"), a celebrated Egyptian deity, whose worship was universal throughout Egypt. This name appears in the hieroglyphic texts as early as the 4th dynasty, and is expressed by a throne and eye; at a later period, that of the 19th, a palanquin is substituted for a throne; and under the Romans, the pupil of the eye for the eye itself. Osiris does not indeed appear to have been universally honored till the time of the 11th and 12th dynasties, or about 1800 B.C., when Abydos, which was reputed to be his burial-place, rose into importance. In the monuments of this age he is called great god, eternal ruler, dwelling in the west, and lord of Abut or Abydos. Even at the most remote period, individuals after death were supposed to become an Osiris; and all the prayers and ceremonies performed or addressed to them were in this character, referring to their future life and resurrection. At the time of the 18th dynasty, this title of Osiris was prefixed to their names, and continued to be so till the time of the Romans and fall of paganism.

In the Ritual, and other inscriptions, Osiris is said to be the son of Seb or Saturn, and born of Nu or Rhea; to be the father of Horus by Isis, of Anubis, and of the four genii of the dead. Many mystic notions were connected with Osiris; he was sometimes thought to be the son of Ra, the sun, or of Atum, the setting sun, and the Bennu or Phenix; also to be uncreate, or self-engendered, and he is identified in some instances with the Sun or the creator, and the Pluto or judge of Hades. Osiris was born on the first of the Epagomenæ, or five additional days of the year. When born, Chronos or Saturn is said to have given him in charge to Pamyles; having become king of Egypt, he is stated to have civilized the Egyptians, and especially to have taught them agricul ture, the culture of the vine, and the art of making beer; he afterwards traveled over the earth, and conquered the people everywhere by his persuasion. During his absence, his kingdom was confided to Isis, who guarded it strictly, and Set or Typhon, the brother of Osiris (who was born on the third of the Epagomenæ), was unable to revolt against him. Typhon had, however, persuaded 72 other persons, and Aso, the queen of Ethiopia, to join him in a conspiracy; and having taken the measure of Osiris, he had a chest made of the same dimensions, richly ornamented and carved, and produced it at a banquet, where he promised to give it to whomsoever it should fit; and when all had lain down and tried it, and it suited none, Osiris at last laid himself down in it, and was immediately covered over by the conspirators, who placed the lid upon it, and fastened it with nails and molten lead. The chest was then hurled into the Nile, and floated down the Tanaitic mouth into the sea. This happened on the 17th of the month Athyr, in the 28th year of the reign or age of Osiris. Khem or Pan, and his attendant deities, dis covered the loss of the god; Isis immediately cut off a lock of hair and went into mourning, and proceeded in search of Anubis, the child of her sister Nephthys by Osiris, and having found him, brought him up. The chest having floated to Byblos, had lodged in a tamarisk, and became inclosed in the tree, which was cut down by the king, and the trunk, containing the chest and the body of the god, converted into a pillar to support the roof of the palace. The goddess proceeded to Byblos, and ingratiated herself with the queen's women by plaiting their hair and imparting to it an ambrosial smell, so that the monarch, whose name was Melcarthus, and his wife, Saosis or Nemanoun, invited her to court to take care of the royal child. She endeavored to confer immortality upon him by placing him on a fire, and changing herself into a swallow, flew round the pillar and bemoaned her fate. The queen became alarmed at the danger of her child; Isis revealed herself and asked for the pillar of tamarisk wood, which was given her. She then cut it open, and took out the chest, making great lamentations, and subsequently sailed for Egypt, with the eldest of the king's sons. The goddess, intending to visit Horus her son at Buto, deposited the chest in an unfrequented spot; but Typhon discovered it by the light of the moon, tore it into 14 pieces, and distributed each to a nome or district. Isis recovered all by passing the marshes in a boat of papyrus; all except the phallus, which had been eaten by the lepidotus, the phagrus, and oxyrhynchus fish. Subsequently, a battle took place between Horus and Typhon or Set, which lasted three days, and ended by Typhon having fetters placed upon him. Isis, however, liberated Typhon, which so enraged Horus that he tore off her diadem, but Teti or Thoth placed on her the head of a cow instead. Typhon finally accused Horus of illegitimacy; but the question was decided between them by Teti or Thoth and the gods. From Osiris, after his death, and Isis sprung Harpocrates. See HARPOCRATES. Osiris seems to have been finally revived, and to have become the judge of the Karneter or Hades, presiding at the final judgment of souls in the Hall of the two Truths, with the 42 demons who presided over the capital sins, and awarding to the soul its final destiny. Thoth or Hermes recorded the judgment, and justified the deceased against his accusers, as he had formerly done for Osiris.

Considerable diversity of opinion existed amongst the ancients themselves as to the meaning of the myth of Osiris. He represented, according to Plutarch, the inundation of the Nile; Isis, the irrigated land; Horus, the vapors; Buto, the marshes; Nephthys, the edge of the desert; Anubis, the barren soil; Typhon, was the sea; the conspirators,

the drought; the chest, the river's banks. The Tanaitic branch was the one which overflowed unprofitably; the 28 years, the number of cubits which the Nile rose at Elephantine; Harpocrates, the first shootings of the corn. Such are the naturalistic interpretations of Plutarch; but there appears in it the dualistic principle of good and evil, represented by Osiris and Set or Typhon, or again paralleled by the contest of Ra or the sun, and Apophis or darkness. The difficulty of interpretation increased from the form of Osiris having become blended or identified with that of other deities, especially Ptah-Socharis, the pigmy of Memphis, and the bull Hapis or Apis, the avatar of Ptah. Osiris was the head of a tetrad of deities, whose local worship was at Abydos, but who were the last repetition of the gods of the other nomes of Egypt, and who had assumed an heroic or mortal type. In form, Osiris is always represented swathed or mummied in allusion to his embalmment; a net-work, suggestive of the net by which his remains were fished out of the Nile, covers this dress; on his head he wears the cap *atf*, having at each side the feather of truth, of which he was the lord. This is placed on the horns of a goat. His hands hold the crook and whip, to indicate his governing and directing power; and his feet are based on the cubit of truth; a panther's skin on a pole is often placed before him, and festoons of grapes hang over his shrine, connecting him with Dionysos. As "the good being," or Onnophris the meek-hearted, the king of heaven, he wears the white or upper crown. Another and rarer type of him represents him as the *Tat*, or emblem of stability, wearing the crown of the two Truths upon his head.

OSKALOO'SA, city and co. seat of Mahaska co., Ia.; between the Keokuk and Des Moines rivers, and on the Burlington Route, the Chicago, Rock Island and Pacific, and the Iowa Central railroads; 62 miles s.e. of Des Moines. It is the seat of Oskaloosa college (Christian) and Penn college (Friends), and has a public high school, a preparatory and normal school, business college, and public and school libraries. There are gas and electric lights, electric street railroad, national, state, and private banks, daily, weekly, and monthly periodicals, and manufactories of flour, packed meat, woolen goods, furnaces, vitrified brick, and iron and brass goods. In the vicinity are inexhaustible deposits of coal and iron, extensively mined, besides fire-clay and limestone, and there are large agricultural and stock-raising interests. The yearly meetings of the society of Friends in Iowa are held here. Pop. '90, 6,558.

OSMAN. See OTHMAN.

OSMAN DIGNA, a noted Mahdist general, said to be George Nisbet, the son of a Scotchman, and to have been born in Rouen, France, in 1836. His father moved in 1849 to Alexandria and soon died, and the widow married a Turk named Osman who adopted young Nisbet and called him Osman Ali. After the death of the stepfather, Osman Ali took up his slave trade at Suakin. His business of slave selling being broken up by the Anglo-Egyptian Convention he endeavored to excite a rebellion, and, failing, allied himself with the anti-Egyptian movement in the Soudan under El Mahdi; received the name of Digna from the fulness of his beard; also the title of the "Emir of the Dervish of God"; defeated the British under Baker Pasha in February and was defeated by the British under Graham in March, 1884; was defeated by the force under Gen. Grenfell in 1888; and led raids into the Soudan in 1892 and 1893.

OSMAN, NUBAR PASHA, marshal, well known in connection with the defense of Plevna against the Russians in 1877, was b. in 1832 in Asia Minor. He took part in suppressing the rebellions of Syria (1860), of Crete (1867), and the Yemen (1874). After his gallant resistance and the fall of Plevna he returned to Constantinople and became commander-in-chief of the imperial guard (1878), governor-general of Crete, minister of war, 1878–80 and 1881–84; and subsequently grand marshal of the palace.

OSMIUM (symb. Os; old equiv. 100; new eq. 193; spec. grav. 22.4) is one of the noble metals which occurs in association with platinum in the form of an alloy with iridium. It may be obtained in the metallic condition by several processes which yield it either in thin, dark-gray glistening scales, or as a dense iron-black mass. It is the least fusible of all the metals; the oxyhydrogen jet volatilizing but not fusing it.

Five oxides of osmium are known—viz., the *monoxide*, OsO, which is of a grayish black color, and is insoluble in acids; the *sesquioxide*, Os_2O_3, a black powder, also insoluble in acids; the *dioxide*, OsO_2, which has a coppery lustre; the *trioxide*, OsO_3, which possesses the character of a weak acid, but has not been isolated; and the *tetroxide*, OsO_4, which occurs in colorless, glistening, acicular crystals, freely soluble in water, and very volatile. At about 212° F., this compound gives off an extremely irritating and irrespirable vapor; and hence the name of the metal (from the Greek word *osmē*, odor). It produces a permanent black stain upon the skin, and gives a blue precipitate with tincture of galls. Osmium also forms two chlorides, which correspond in composition to the second and third of the oxides mentioned above. This metal was discovered by Tennant in 1803.

OSMOSE; DIALYSIS. The earlier discoveries of Dutrochet and Graham have been briefly described in the article on Diffusion (q.v.). The subject has, however, been much extended recently, principally by the investigations of Graham; and as the whole phenomena are exceedingly interesting and important, since secretion, absorption, and various other organic processes are to a great extent dependent on them, some further detail, especially of these later facts, may here be given.

When two different liquids are separated by a bladder or other membrane, or a piece of calico coated with coagulated albumen, there is always a more or less rapid transfer-

ence of the two liquids in opposite directions through the diaphragm. In certain cases, the explanation given in the article referred to is complete, but in others it appears to be insufficient. Graham has made an extensive series of experiments upon osmose, where distilled water was on one side of the diaphragm, and various liquids and solutions on the other, and has arrived at many general results, of which the following are the more important. The osmose is considered as *positive* when more of the water passes through the diaphragm than of the other liquid. Such substances as gum, gelatine, etc., produce scarcely any effect. Solutions of neutral salts, such as common salt, Epsom salts, etc., follow the ordinary law of diffusion, as if no diaphragm had been interposed. Acid salts in solution, and dilute acids, pass rapidly into the water—or the osmose is *negative;* while alkaline solutions give, in general, a strong *positive* effect.

In all the cases in which an osmotic action occurs which cannot be explained by capillary forces, there is chemical action on the diaphragm; and conversely, such osmose cannot be produced if the material of the diaphragm be not acted on by the liquids in contact with it.

But the most remarkable results of Graham's later investigations are those relating to dialysis—i.e., to the separation of the constituents of mixtures, and even the decomposition of chemical compounds, by osmose. The results of his earlier investigations, above given, show a remarkable difference between two classes of bodies; gum, gelatine, etc., which form viscous solutions, on the one hand; and salts, acids, and alkalies, on the other. The first class he has called *colloids;* the second, *crystalloids.* The former are extremely sluggish, the latter comparatively rapid in their action. Thus, of common salt and albumen, under precisely similar circumstances, there pass through the diaphragm in a given time quantities which are as 25 to 1 by weight. Hence, if a solution containing both classes of substances be opposed to pure water, the crystalloids will pass rapidly through the diaphragm, and the colloids slowly. This process promises to be of very great value in medical jurisprudence, as, without introducing any new substance (except the diaphragm and distilled water), we have the means of separating from the generally colloidal contents of animal viscera such poisonous crystalloids as white arsenic, vegetable alkaloids, etc., which by the old methods was in general attended with great difficulty, and often uncertainty. These methods are still in their infancy. If a strong electric current is passed through two liquids separated by a diaphragm a difference of level is produced, the higher level being on the side towards which the current flows, indicating that the liquid follows the current. This action is called *cataphoresis* and is used to a considerable extent in medicine. Cataphoresis applies to cases where substances such as iodine, cocaine, quinine, etc., in solution are passed through tissues of the body by means of an electric current.

OSMUN, Thomas Embley, m.d., known by his pseudonym of Alfred Ayres, b. Ohio in 1826; has published *The Verbalist*, *The Orthoëpist*, an edition of Cobbett's *English Grammar*, *The Essentials of Elocution*, etc.

OSMUN'DA, a genus of ferns, distinguished by spore-cases in branched, stalked masses. The Osmund-royal, Royal, or Flowering Fern (*O. regalis*), is the noblest and most striking of North American ferns. It is very frequent in those districts of England and localities most remarkable for the moisture of their climate, growing in boggy places and the wet margins of woods. It has bipinnate fronds, and panicled spore-cases upon altered fronds, which appear as stalks distinct from the fronds, and assimilate the general appearance to that of a phanerogamous plant. It sometimes rises to 5 ft. in height. It is found in many parts of Europe, and in Great Britain. It possesses tonic and styptic properties, and its root-stocks were formerly employed in scrofula. The root-stocks abound in a mucilaginous substance, which is used in the n. of Europe instead of starch. The Cinnamon Fern (*O. cinnamonea*) is another common North American species.

OSNABRÜCK, or Osnaburg, a territory occupying the western portion of the Prussian province of Hanover, and embracing the principality of Osnabrück, the countships of Lingen and of Bentheim, and the duchy of Arensberg-Meppen and the lordship of Papenburg. Area, 2,408 sq.m.; pop. '90, 299,889.

OSNABRÜCK, the chief t. of the territory, lies in the midst of the extended and fruitful valley of the Hase, 70 m. w.s.w. of Hanover. It still ranks as one of the principal commercial cities of Hanover, although it cannot boast of the pre-eminence which it enjoyed before the establishment of the Zollverein. Pop. '95, 45,131. Osnabrück has thriving manufactories of cigars and tobacco, paper-hangings, and cotton and woolen goods, and extensive works for the preparation of mineral dyes and cement, besides iron, machinery, and carriage manufactories. According to the opinion of antiquarians, Osnabrück stands on the site of the ancient Wittekindsburg, which was raised to a bishopric in 783 by Charlemagne, some relics of whom, together with the pretended bones of the martyrs Crispinus and Crispinianus, are preserved in the cathedral—a fine specimen of the Byzantine style of architecture of the 12th century. The church of St. Mary, a noble Gothic building, was erected by the burghers of Osnabrück in the 14th c. during their contentions with their haughty ecclesiastical rulers, and contains the grave of Möser, in whose honor a statue was placed in the square of the cathedral in 1836. The signing of the peace of Westphalia in 1648, in an apartment of the town-hall, is commemorated by the preservation of the portraits of all the ambassadors who took part in the treaty. It was decreed in this treaty that the ancient bishopric of Osnabrück should thenceforth be occupied alternately by a Roman Catholic prelate and

a Protestant secular prince of the house of Brunswick-Luneburg; and after having been last held by Frederick, duke of York, the district of Osnabrück was ceded to Hanover in 1803, and the chapter finally dissolved.

OSORIO, Jeronymo, 1506–80; b. Lisbon; studied languages, philosophy, and theology, at Salamanca, Paris, and Bologna respectively. On his return to Portugal he was appointed to various offices by the royal patronage, and finally became bishop of Silves. He published, besides a number of biblical commentaries, treatises *De Nobilitate Civili et de Nobilitate Christiana; De Justitia Cœlesti; De Regis Institutione*, etc. His most noted works are *De Rebus Emmanuelis Regis Lusitaniæ, Virtute et Auspicio Gestis Libri XII.*, and his treatise *De Gloria*, written with so much elegance that D'Alembert asserted it was a work of Cicero of which Osorio claimed the credit. Many of his works have been translated into English, French, and Portuguese.

OSPHROMENUS, a genus of fishes, natives of southern and eastern Asia, of which the celebrated *gourami*, so highly prized for food, is the chief representative. They have recently been erected into a family, but their genera are not yet made out. See Anabasidæ.

OSPREY, *Pandion*, a genus of *falconidæ*, of which only one species is known (*P. haliaëtus*), also called the Fishing Hawk or Fishing Eagle, and sometimes the Bald Buzzard. It is singular among the *falconidæ* in preying *exclusively* on fish; and to this its whole structure and habits are adapted. Its whole length is about 22 in.; it is of a dark-brown color, variegated with black, gray, and white. The under parts are white, except a light-brown band across the chest. The bill is short, strong, rounded, and broad. The tail is rather long, the wings are very long, extending beyond the tail; the under surface of the toes remarkably rough, covered with small pointed scales, suited for the securing of slippery prey; the claws not grooved beneath, as in most of the *falconidæ*. The feathers are destitute of the supplementary plume, which is considerably developed in most of the *falconidæ*. The intestine differs from that of the other *falconidæ* in being very slender and of great length.

The osprey is chiefly to be seen near the sea, lakes, and large rivers. No bird is more widely diffused; it is found in all quarters of the world; its geographical range including Europe, Asia, Africa, North and South America, and Australia, and both very warm and very cold climates. It is everywhere a bird of passage, retiring from high northern latitudes on the appearance of frost. It occurs on many parts of the British coasts, and is sometimes found in inland districts, but is nowhere abundant in Britain. In some places in Scotland it still breeds year after year, on the highest summit of a ruined building, or the top of an old tree. It is very plentiful in some parts of North America; and its return in the beginning of spring is hailed with joy by fishermen, as indicative of the appearance of fish. The nest is a huge structure of rotten sticks, in the outer interstices of which smaller birds sometimes make their nests; for the osprey never preys on birds, and is not dreaded by them. It is, indeed, of a pacific and timorous disposition, and readily abandons its prey to the white-headed eagle (or erne, q.v.). In the days of falconry, the osprey, being very docile, was sometimes trained and used for catching fish. See illus., Birds, vol. II.

OSSA, the ancient name of a mountain on the e. side of Thessaly, near Pelion, and separated from Olympus by the vale of Tempe. It is now called Kissavo. The conical summit is covered with snow during the greater part of the year. The ancients placed the seat of the centaurs and giants in the neighborhood of Pelion and Ossa.

OSSEIN. This term is applied by chemists to the substance in the tissue of the bones which yields gluten. It is obtained by the prolonged action of dilute hydrochloric acid on bone, which dissolves all the earthy matter. The material thus procured retains the form of the bone without its hardness, and must be repeatedly washed with water, and treated with alcohol and ether to remove traces of salts, fat, etc. It is insoluble in water, but is converted into gluten (one of the forms of gelatine) by the action of boiling water —a transformation which is much facilitated if a little acid be present. The ossein yielded by different kinds of animals requires different times for its conversion into gluten; and that of young animals changes more rapidly than that of adults of the same species. It appears to exist in the bones in a state of freedom—that is to say, not in combination with any of the salts of lime. Fremy's analyses show that the amount of gluten is precisely the same as that of the ossein which yields it, and that the two substances are isomeric.

OSSIAN, Poems of. Ossian, or Oisin (a word which is interpreted the "little fawn"), a Celtic warrior-poet, is said to have lived in the 3d c., and to have been the son of Fingal or Fin MacCumhaill. The poems which are ascribed to him in manuscripts of any antiquity are few and short, and of no remarkable merit. But in 1760–63, a Highland school-master, James Macpherson (q.v.), published two epics, *Fingal* and *Temora*, and several smaller pieces and fragments, which he affirmed to be translations into English prose of Gaelic poems written by Ossian and preserved by oral tradition in the Scottish Highlands. Their success was wonderful. They were received with admiration in almost every country of Europe, and were translated not only into French and Italian, but into Danish and Polish. But their authenticity was challenged almost as

soon as they saw the light, and a long and angry controversy followed. That they were what they claimed to be was maintained by Dr. Blair, lord Kames, the poet Gray, and sir John Sinclair. That they were more or less the fabrication of Macpherson himself was maintained by Dr. Johnson, David Hume, Malcolm Laing, and John Pinkerton. While this controversy still raged, another sprang up scarcely less angry or protracted. Macpherson made Ossian a Scotch Highlander, but the Irish claimed him as an Irishman. The fact is he was both: for in those early times the n.e. of Ireland and the w. coast of Scotland were practically one country; the people spoke one language, they were of one blood; and the narrow strip of sea that divided them served not as a wall of separation, but rather as an easy passage of communication by means of boats. As to the real authorship of the poems, as the original manuscripts which Macpherson used have never been produced, there will always remain doubts; one thing only we know, that he did use materials of the same nature as the Ossianic traditions that may be picked up from the mouth of the people in many parts of Ireland and the Highlands at the present day; but how far under Macpherson's hands they were remodeled remains a secret. The recent contribution to this question made by J. F. Campbell in his *Leabhav na Feinne*—a digest of all the Ossianic ballads either published by others or collected by Mr. Campbell himself—has not tended much to clear up the matter. No trace of Macpherson's two large poems has been recovered. On one point all Gaelic scholars seem agreed—that Macpherson did not, and could not have written the Gaelic. Poems ascribed to Ossian, committed to writing in the Highlands in the first half of the 16th c., are printed in the *Dean of Lismore's Book* (Edin. 1862), with translations into English and into modern Gaelic. The poems ascribed to Ossian, preserved in Ireland, were published by the Ossianic society in 6 volumes (Dublin, 1854–61). Students of the Ossianic poems will find much assistance from consulting the edition of the Gaelic with a new translation by Dr. Clark of Kilmallie (Edin. 1870). In 1876 the Ossian controversy was again agitated, but came to nothing.

OSSIFICATION, or the formation of bone, is a process to which physiologists have paid much attention, but regarding which there is still considerable difference of opinion. On one point, however, there is a general agreement—viz., that the bones are not in any instance a primary formation, but always result from the transformation and earthy impregnation of some pre-existing tissue, which is most commonly either cartilage or a membrane containing cell-nuclei. At a very early period of embryonic life, as soon, indeed, as any structural differences can be detected, the material from which the bones are to be formed becomes mapped out as a soft gelatinous substance, which may be distinguished from the other tissues by being rather less transparent, and soon becoming decidedly opaque. From this beginning the bones are formed in two ways; either the tissue just described becomes converted into cartilage, which is afterwards replaced by bone, or a germinal membrane is formed, in which the ossifying process takes place. The latter is the most simple and rapid mode of forming bone. When ossification commences, the membrane becomes more opaque, and exhibits a decided fibrous character, the fibers being arranged more or less in a reticulated manner. These fibers become more distinct and granular from impregnation with lime salts, and are converted into incipient bone, while the cells which are scattered among them shoot out into the bone corpuscles, from which the canaliculi are extended probably by resorption. The facial and cranial bones, with the exception of those at the base of the skull, are thus formed without the intervention of any cartilage.

The process of ossification in cartilage (q.v.) is too complex and difficult to follow in these pages. Some physiologists hold that when ossification is carried on in cartilage a complete molecular replacement of one substance by the other takes place; while others believe that more or less of the cartilaginous matrix remains, and becomes impregnated with earthy matter at the same time that gluten is substituted for chondrine (chondrine being the variety of gelatine that is yielded by ossein or bone-cartilage before ossification, while gluten is yielded after that process is established). All the bones of the body, excepting those of the head and face already mentioned, are at first formed, in part at all events, from cartilage.

The time at which ossification commences does not at all follow the order in which the primordial cartilage is laid down. Thus the cartilage of the vertebræ appears before there is any trace of that of the clavicle; yet at birth the ossification of the latter is almost complete, while that of the former is very imperfect for many years. We will briefly trace the process of ossification as it occurs in the human femur or thigh-bone. Ossification commences in the interior of the cartilage at determinate points, which are hence termed *points* or *centers of ossification*. From these points the process advances into the surrounding substance. In the second month of fœtal life, one of these centers shows itself about the middle of the shaft, and from this point ossification rapidly extends upwards and downwards along the whole length of the shaft. The upper and lower ends remain cartilaginous, and it is not till the last month of fœtal life that a second center appears at the lower end. The third center, from which the upper end of the bone is ossified, does not appear till about a year after birth. The bone now consists of two extremities, or *epiphyses*, with an intermediate shaft or *diaphysis;* and the superior epiphysis is not ossified to the shaft until about the 18th. and the inferior until after the 20th

year. At about the 5th year a fourth ossific center is developed in the cartilage of the greater trochanter, and a fifth center appears in the lesser trochanter at about the 14th year. These osseous processes, thus developed from special ossific centers, are termed *apophyses.* Most of the long bones are developed in a corresponding way. It is a curious fact (which is of such general occurrence that it may be regarded as a law) that in the skeletons, both of man and of the lower animals, the union of the various apophyses to the epiphyses, and of the epiphyses to the diaphysis or shaft, takes place in the inverse order to that in which their ossification began. The advantages derived from this subdivision of the long bones into segments, with interposed cartilaginous plates, are obvious. Besides the greater facilities for growth thus afforded, the flexibility of the bony frame-work is thereby greatly increased, and its escape from injury during the many falls incidental to this period of life is in no small degree attributable to this cause. See Humphry *On the Human Skeleton*, pp. 33 to 45.

True ossification sometimes occurs as a morbid process; but in many cases, the term is incorrectly used (especially in the case of blood-vessels) to designate a hard calcareous deposit, in which the characteristic microscopic appearances of true bone are altogether absent.

In one sense, the osseous tissue that is formed in regeneration of destroyed or fractured bones may be regarded as due to a morbid, although a restorative action. Hypertrophy of bone is by no means rare, being sometimes local, forming a protuberance on the external surface, in which case it is termed an *exostosis;* and sometimes extending over the whole bone or over several bones, giving rise to the condition known as *hyperostosis.* Again, true osseous tissue occasionally occurs in parts in which, in the normal condition, no bone existed, as in the duramater, in the so-called permanent cartilages (as those of the larynx, ribs, etc.), in the tendons of certain muscles, and in certain tumors. The peculiar causes of the osseous formations which are unconnected with bone are not known.

Calcareous deposits or concretions not exhibiting the microscopical character of bone, but often falsely termed ossifications, are of no unfrequent occurrence. Analyses of such concretions occurring in pus, in the valves of the heart, in the muscles, and in the lungs, are given by Vogel in his *Pathological Anatomy of the Human Body;* and in some of these concretions the phosphate and carbonate of lime occur in nearly the same percentages as those in which they are found in bone. The diseased condition usually but incorrectly called ossification of the arteries, is of sufficient importance to require a brief notice. In consequence of the deposition of earthy or calcareous matter in the middle coat of the artery, the vessel loses all its elasticity, and becomes a rigid, unyielding tube. All parts of the arterial system are liable to this change; but it is more frequently met with in the ascending portion and arch of the aorta, than in any other part of that vessel, and is more common in the lower extremities than the upper. The affection is usually partial, but occasionally it appears to be almost universal. Thus, Dr. Adams has recorded a case, in the Dublin hospital reports, in which no pulsation could be felt in any part of the body, and even the heart offered no other sign of action than a slight undulating sound. Old age strongly predisposes to this diseased condition, and probably few very aged persons are altogether exempt from it. There is also reason to believe that gout and rheumatism favor these calcareous deposits. This condition of the arteries may give rise to aneurism, to gangrene of the extremities in aged persons, and to atrophy, and consequent feebleness of the brain and heart. (The coronary arteries, which supply the heart with the arterial blood necessary for its own nutrition, are very often, although not always, ossified in angina pectoris). Moreover, this condition of the vessels very materially increases the risk from severe accidents and surgical operations.

OSSOLI, MARGARET, Marchioness. See FULLER.

OSSORY, THOMAS **BUTLER,** Earl of, 1634–80; b. Ireland; son of James, duke of Ormond. He fought on the royalist side in the English civil war, and after being imprisoned in the Tower for eight months, went to Holland. He came back with Charles II. at the restoration, and was appointed lieut.gen. of the Irish army. In 1666 he was made lord-butler of Moore Park. The same year he participated in the naval fight with the Dutch. In 1673 he was raised to the rank of admiral; in 1677 he led the English contingent in the army of the prince of Orange; and in 1678 he had a brilliant part in the defeat of marshal Luxembourg at Mons.

OSTADE, ADRIAN VAN, a celebrated painter and engraver of the Dutch school, was born at Lübeck, in n. Germany, in 1610. His teachers were Franz Hals and Rembrandt. He followed his art at Haarlem, till the French army of Louis XIV. threatened Holland, when he removed to Amsterdam, where he spent the remainder of his life. He died in 1685. Country-dancing greens, farm-yards, stables, the interiors of rustic hovels and beer-shops, are the places which he loved to paint; and his persons are, for the most part, coarse peasant carls, drunken tobacco-smokers, or peasant women employed in country work. In everything he did there is a bright and vivid naturalness. Not equal to Teniers in originality and quiet humor, he surpasses him in the force and fineness of his execution, though he is not free from trivialty and repetitions, and inaccuracies in drawing. He was a prolific painter, and his works are to be found in all the museums and collections of the Netherlands, Germany, France, and England. They have been well

engraved by Vischer, Suyderoef, and himself.—ISAAC VAN OSTADÉ, brother of Adrian, also a painter, was born at Lübeck in 1612, and died at Amsterdam in 1671. He did not equal his brother, whose style he labored to imitate.

OSTASHKOV', a manufacturing district t. of Great Russia, in the government of Tver, stands on the s.e. shore of lake Seliguer; lat. 57° 10′ n., long. 33° 6′ east. The first settlements on this site are said to have taken place in 1230. Pop. '92, 12,104. Skin-dressing, boot-making, and fishing in the neighboring lakes are the principal employments of the inhabitants. The woods in the vicinity furnish bark for tanning purposes, and charcoal for the blacksmiths' shops. There are in Ostashkoff 37 tan-yards, in which skins are dressed, and Russian leather prepared to the amount of £90,000 annually. The leather prepared at Savine's tanyard is known in England, Austria, Italy, and North America. Two hundred and eighty thousand pairs of boots are made annually, and 400 men and 1000 women are engaged in the manufacture. Manufactures of hatchets and scythes are also carried on. The commerce of Ostashkoff is small, however, owing to its remote distance from important lines of communication.

OSTEND', a strongly fortified t. of the Belgian province of w. Flanders, on the German ocean, at the opening of the Ostend and Bruges canal, and on the state railway. Pop. '95, 27,484. Notwithstanding its proximity to the sea, the shallowness of the harbor prevents large ships from entering the port except at high tide. It ranks, however, as the second seaport of the kingdom, Antwerp being the first, and is fortified with walls and broad ditches. It has some good manufactories for linens, sail-cloths, and tobacco, and several sugar, salt, and candle-works. From its position as a station for the steamers plying daily between London, Dover, and the continent, and as the terminus of various branches of railway in connection with the great French and German lines, it is a lively and active place of transport traffic, and is resorted to in the summer as a bathing-place by 20,000 persons. It is, moreover, an important station for oyster, cod, and herring fishing; has a good naval school, an athenæum, industrial school, episcopal college, and other educational institutions, some ship-yards, and is the seat of a commercial tribunal, and a chamber of customs. It imports coal, wood, wool, raw silk, etc., and exports butter, meat, and flax. The harbor is furnished with a light-house, and is provided with an admirably-constructed stone promenade for the accommodation of the public. Ostend is memorable for the protracted siege which it underwent from 1601 to 1604, terminating in the surrender of the Dutch and Flemish garrison to the Spanish commander, Spinola.

OSTEND MANIFESTO. A document drawn up at Ostend (q.v.), August, 1854, by Messrs. Buchanan, Mason and Soulé, United States ministers at London, Paris, and Madrid, respectively, showing why Cuba should and, under certain circumstances must, belong to the United States. See CUBA.

OSTEOGLOS'SIDÆ, a family of fresh water teleost fishes, characterized by the peculiar form of the head. The body is covered with mosaic-like hard scales ; gili apertures large ; branchiostegal rays numerous ; pectoral fins low on each side ; vertebræ from 60 to 80. The family is divided into two sub-families, *osteoglossinæ*, represented in the Philippine islands and Australia ; and *heterotinæ*, having one genus *heterotis*, peculiar to w. Africa, and another *arapaima*, particularly inhabiting the Rio Negro, Brazil.

OSTEOLE'PIS (Gr. bone-scale), a genus of fossil ganoid fish peculiar to the Old Red Sandstone. It is separated from its allies by having the two anal and two dorsal fins alternating with each other. Seven species have been described.

OSTEOL'OGY (Gr. *ostea*, the bones) is that department of anatomy which treats of the chemical and physical properties of the osseous tissue, and of the shape, development, and growth, articulations, etc., of the various bones of which the skeleton is composed. See BONE, OSSIFICATION, SKELETON, etc.

OSTEO-MYELI'TIS, an inflammation of the medullary or lining membrane of the bony cavities. It usually occurs as a consequence of injuries which expose the medullary canal to the air as well as to mechanical injury. It therefore sometimes follows compound fracture and ill-performed amputations, or operations on bad subjects. Its presence may be suspected when, after an injury to, or an operation on a bone, the limb swells and becomes very tender, with formation of abscess and profuse suppuration of a dark and fetid character. It is a very dangerous disease, indeed usually proving fatal, passing into osteo-phlebitis, and then into pyæmia (q.v.). It is of an erysipeloid character, and is generally septic, which adds to the fatality of severe injuries and the larger amputations. There is death of bone, and therefore a natural tendency to its separation from the living parts. If nature succeeds, the *sequestrum*, or separated dead bone, may be removed, which is usually not a difficult operation, because the parts are generally exposed and easily reached with a pair of forceps. Sometimes portions may be wedged in between sound parts of bone, when a small portion of the latter may be removed with a pair of cutting forceps, or a small saw. The constitutional treatment consists in supporting the patient's strength with nourishing food, such as strong beef-tea, beef-steak, chops, eggs, milk-punch, wine, cinchona, etc., and perhaps the administration in some cases, of a ferruginous tonic. Great attention must be paid to cleanliness and careful ventilation.

OSTERHAUS, PETER JOSEPH, b. Prussia, abt. 1820; served as an officer in the Prussian army, came to the United States, settled in St. Louis, and entered the U. S. volunteer

army in the first year of the civil war as maj. of the 2d Missouri regiment. He participated in the battle of Wilson's creek, Aug. 10, 1861, under Gen. Lyon who was killed, retiring under command of col. Sigel. He was promoted to the colonelcy of the 12th Missouri, and commanded a brigade under gen. Fremont, and also in the expedition conducted by S. R. Curtis, maj.gen. commanding the army operating in s.w. Missouri, resulting in the battle of Pea Ridge or Elk Horn, March 6–8, 1862, between the confederates under gen. Van Dorn, and the Union forces under Gen. Curtis, the latter gaining the victory. In this action he commanded a division. June 9, 1862, he received his commission as brig.gen., and in the following December was placed in command of a division of the 13th corps at Helena, Ark., with which he assisted in the capture of Arkansas post, under Gen. McClernand and Admiral Porter, Jan. 11, 1863; also in the Vicksburg campaign, resulting in the surrender on July 4, 1863. He commanded the 1st division, 15th corps at Chattanooga under Gens. Rosecrans and Thomas, and at the battle of Missionary Ridge, the heights on the e. overlooking Chattanooga (Lookout mountain being on the w.), under Gen. Sherman, Nov. 25–26, ending in the defeat of the confederates. In its results this was one of the most important of the war. On July 23d he was made maj.gen., and followed Sherman from Chattanooga to the occupation of Atlanta, Sept. 1, 1864, commanding the 15th corps "from Atlanta to the sea." He was chief of staff to Gen. Canby at the surrender of the confederate Gen. Richard Taylor, May 4, 1865; was mustered out Feb., 1866; became U. S. consul at Lyons, France, the same year; and subsequently returned to Germany.

OSTERO'DE, a small t. of Prussia in the province of Hanover, situated at the western base of the Harz mountains, on the Söse, an affluent of the Leine, 18 m. n.e. of Göttingen. It contains large grain stores, from which the miners of the neighborhood and their families are supplied with grain at a low and fixed rate. Cotton, woolen, and linen fabrics and hosiery are extensively manufactured. Pop. 6600.

OSTIA, a city of Latium, at the mouth of the Tiber, about 16 m. from Rome. It is said to have been founded by Ancus Martius, and was regarded as the oldest Roman colony. It first acquired importance from its salt-works, the establishment of which is attributed to Ancus Martius, and afterwards as the port where the Sicilian, Sardinian, and African corn shipped for Rome was landed; yet its name first occurs during the second Punic war. It was long, too, the principal station of the Roman navy; but its harbor was exceedingly bad, and gradually the entrance became silted up with alluvial deposits, so that vessels could no longer approach it, but were compelled to ride at anchor in the open roadstead, and to disembark their cargoes there. At length the Emperor Claudius dug a new harbor or basin two m. n. of Ostia, and connected it with the Tiber by a canal. It was named the *Portus Augusti,* and around it soon sprung up a new town called *Portus Ostiensis, Portus Urbis, Portus Romæ,* and often simply *Portus.* Yet it was not till nearly the close of the Roman empire that the prosperity of Ostia as a city began to decline. Its decay, however, was rapid, and in the 8th c. it was a mere ruin. During the middle ages a village—the modern Ostia—was built about half a mile above the ancient one; but it has not more than 1000, or so, permanent inhabitants, who still carry on the manufacture of salt, established in the prehistoric times of ancient Rome. The ruins of Ostia extend for a mile and a half along the banks of the Tiber, and are nearly a mile in breadth. See Nibby's *Dintorni di Roma* (vol. ii).

OSTRA'CION, a genus, and OSTRACIONIDÆ, a family of fishes of the order *Plectognathi.* They are remarkably distinguished by having the whole body covered with an inflexible tuberculated coat of mail, formed of six-sided bony scales or plates combined in a tesselated quincuncial manner, the fleshy lips, the fins, and the tail protruding through holes in the armor. The gill-opening appears in the armor as a mere slit, bordered with a skinny edge, but there is a true gill-cover within. There are no ventral fins. The vertebræ are generally coalescent. There is little muscular substance, and in some species it is reputed poisonous; but the liver is large, and yields much oil. Some of the species are known by the names of TRUNK-FISH and COFFER-FISH. They are mostly found in the Indian and American seas. None are British.

OSTRACISM, a right exercised by the people of Athens of banishing for a time any person whose services, rank, or wealth appeared to be dangerous to the liberty of his fellow-citizens, or inconsistent with their political equality. It was not a punishment for any particular crime, but rather, as has been observed, a precautionary measure to remove such leaders as were obviously exercising a dangerous ascendency in the state. Ostracism was introduced by Cleisthenes about the beginning of the 6th c. B.C., after the expulsion of the Peisistratidæ. The people were annually asked by the Prytanes if they wished to exercise this right, and if they did, a public assembly was held, and each citizen had opportunity of depositing, in a place appointed for the purpose, a potsherd (*ostrakon*) or small earthen tablet, on which was written the name of the person for whose banishment he voted. Six thousand votes were necessary for the banishment of any person; but the greatest men of Athens—Miltiades, Themistocles, Cimon, Alcibiades, etc.—were subjected to this treatment. The banishment was at first for ten years, but the period was afterward restricted to five. Property and civil rights or honors remained unaffected by it. Alcibiades succeeded in obtaining the final abolition of ostracism

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OSTRICH, CASSOWARY, ETC.—1. Guinea fowl. 2. Heath-cock. 3. Curassow. 4
ostrich. 9. Foot of ostrich. 10. Nandu. 11. Ibis. 12. European woodcoc
bustard. 18. Cariama.

keleton of cassowary. 5. Head of cassowary. 6. Foot of cassowary. 7. Ostrich. 8. Head of
13. Head of moor-snipe. 14. Oyster-catcher. 15. Head of peewit. 16. Black coot. 17. Dwarf

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of which, however, Plutarch and Aristotle speak as a necessary political expedient, and its utility has been very ably defended in modern times by Mr. Grote (*History of Greece*, vol. iv. pp. 200 *et seq.*).

OSTRÆ'IDÆ a family of lamellibranchiate mollusks of which the common oyster (*ostrea*) is the type. It is sometimes made to include another group, the *pectinidæ*, comprising the scallops, and is sometimes named pectinidæ, instead of ostræidæ. The following are the chief characteristics of the *ostræidæ:* Shell inequivalve, slightly inequilateral, free or attached to the bottom of some object; hinge usually toothless, ligament internal; lobes of the mantle entirely separated; foot small or wanting; a single adductor muscle. In the genus *ostrea* the shell is irregular and attached by the left valve, which is convex, and has a well-marked beak. The upper valve is usually concave or flat, and is the smaller. The hinge is toothless, having a single ligamental pit. The lower valve is more plaited than the upper, and both valves are in some species thus ornamented, as in *ostrea* Marshii of the oolitic formation. In the genus gryphæa the lower valve is much the longer and very much curved, so that it points inwards, and at right angles to the plane of the upper valve, the whole animal having a general resemblance in profile to an ammonite, although belonging to an entirely different class of mollusks. They existed during the triassic and cretaceous epochs. In the genus *exogyra*, which existed in the later oolitic and cretaceous epochs, the beaks are reversed, or turned toward the posterior side of the shell. The genus *ostrea* commences in the carboniferous seas, abounds in the secondary and tertiary periods, and is very plentiful at the present day. A genus, *pernostra*, has been founded for Jurassic oysters, which differ from *ostrea* proper in having the ligament contained in from four to eight transverse grooves or pits. In a second section or sub-family, *anomiadæ*, of ostræidæ there are various forms of which *anomia* may be taken as the type. This latter genus comprises bivalves having a very thin, translucent shell, which is attached to some body by a plug which passes through a hole or notch in the right valve. It appears to have commenced its existence in the cretaceous period, but *limanomia* of Devonian, *anomianella* of the carboniferous, and *placunopsis* of the Jurassic are older forms of the same type. The genus *placuna*, commencing in the tertiary, is allied in many respects to *anomia*, but the shell is unattached. For the group pectinidæ see article, PECTEN. A fourth group of ostræidæ, sometimes regarded as a distinct family (*limadæ*), is represented by the typical genus *lima*, the shell of which is equivalve and unattached, and the beaks separated from one another and eared. The surface is usually partially covered with radiating ribs or ridges, and there is a median cartilage pit and a triangular hinge area. The genus appears to have commenced in the carboniferous, was abundant in the triassic, Jurassic, cretaceous, and tertiary formations, and has representatives at the present day in smaller numbers. The *limoptera* of the Devonian is perhaps an early representative. A fifth group of ostræidæ, which is sometimes ranked as a separate family (*spondylidæ*) is represented by what are known as the thorny oysters, and forms the genus *spondylus*. It has an inequivalve shell, and is attached by the right valve to some other body. The beaks are separated from each other, and the shell is covered with spines or thorns, inclined in a direction from the beak. The genus commenced in the Jurassic, was plentiful in the cretaceous, and has present representatives. The *plicatulæ* resemble *spondylus* by having an inequivalve shell which is attached by the right valve, and by having two hinge teeth in each valve. But the shell is seldom eared, the hinge area is obscure, and the valves are not armed with spines. They extend in time from the trias to the present epoch, and were exceedingly abundant in the lower greensand. The anatomy of the oyster is given in the article under that title.

OSTRICH, *Struthio*, a genus of birds of the order *grallatores*, and tribe *brevipennes* (q.v.), in Cuvier's system—the order *cursores* (or runners) of some ornithologists. In this genus the bill is of moderate length, broad, flattened, rounded at the tip, the mandibles flexible; the head small; the neck long; the legs long (both tibia and tarsus) and very robust, the lower part of the tibia, as well as the tarsus, naked; the feet have only two toes, of which the inner is the largest, and has a short claw, the outer has no claw; the wings are too short to be used for flight, but are useful to aid in running; the plumage is lax and flexible; the wings and tail have long soft drooping plumes. Only one species is known (*S. camelus*), a native of the sandy deserts of Africa and Arabia: the South American ostriches, or nandus (q.v.), constituting a distinct genus. The ostrich is the largest of all birds now existing, being from 6 to 8 ft. in height to the top of its head, and an adult male weighing from 200 to 300 pounds. The male is rather larger than the female. The head and upper part of the neck are scantily covered with a thin down, through which the skin is visible. The young have the head and neck clothed with feathers. The general plumage is glossy black in the adult male, dark grey in the female and young, with a slight sprinkling of white feathers; the long plumes of the wings and tail are white, occasionally marked with black. On each wing are two plumeless shafts, not unlike porcupine's quills. The inner toe is very large, about 7 in. long, and its claw hoof-like. Whilst the sternum is destitute of a keel, and the muscles which move the wings are comparatively weak, those which move the legs are of prodigious strength, so that the ostrich is not only capable of running with great speed, but of striking such a blow with its foot as to make it too formidable for the

leopard and other large beasts of prey to assail it. It has been often known to rip open a dog by a single stroke, and a man is recorded to have suffered the same fate. The eyes of the ostrich are large, and the lids are furnished with lashes. Its sight is keen, so that it descries objects at a great distance in the open desert.

The ostrich shuns the presence of man, but is often to be seen in near proximity to herds of zebras, quaggas, giraffes, antelopes, and other quadrupeds. It is gregarious, although the flocks of ostriches are not generally very large. It is polygamous, one male usually appropriating to himself, when he can, from two to seven females, which seem to make their nest in common, scooping a mere hole in the sand for this purpose. Each female is supposed to lay about ten eggs. The eggs are all placed on end in the nest, which often contains a large number, whilst around it eggs are generally to be found scattered on the sand. Concerning these, it has been supposed that they are intended for the food of the young birds before they are able to go in quest of other food; an improbable notion, not supported by evidence. It seems at least as likely that these scattered eggs are laid by females waiting whilst the nest is occupied by another, and that they are lost to the ostriches and no more regarded. Contrary to a very generally received opinion, the ostrich does not leave her eggs to be hatched entirely by the heat of the sun; or, if this be the case in the warmest regions, it is otherwise in the more northern and southern countries in which this bird is found; and by a remarkable instinct, the ostrich sits upon the eggs by night, when the cold would be too great for them, and leaves them to the sun's heat during the day.

The ostrich feeds exclusively on vegetable substances, its food consisting in great part of grasses and their seeds; so that its visits are much dreaded by the cultivators of the soil in the vicinity of its haunts, a flock of ostriches soon making terrible devastation of a field of corn. The ostrich has a very large crop, a strong gizzard, and a pretty large *proventriculus* between the crop and the gizzard; the intestines are voluminous, and the cœca long, with a remarkable spiral valve. There is a receptacle in which the urine accumulates, as in a bladder, a thing very uncommon in birds.

The ostrich swallows large stones, as small birds swallow grains of sand, to aid the gizzard in the trituration of the food; and in confinement has often been known to swallow very indiscriminately whatever came in the way, pieces of iron, bricks, glass, old shoes, copper coins, etc. Its instincts do not suffice to prevent it from swallowing very unsuitable things; copper coins were fatal in one instance, and a piece of a parasol in another.

The ostrich is very patient of thirst, or is capable of subsisting for a long time without water. It often supplies the want of water by eating the gourds or melons of the desert, to which even the lion is said to resort on the same account.

The speed of the ostrich, when it first sets out, is supposed to be not less than 60 m. an hour; but it does not seem to be capable of keeping up this speed for a long time. It is successfully hunted by men on horseback, who take advantage of its habit of running in a curve, instead of a straight line, so that the hunter knows how to proceed in order to meet it and get within shot. It is often killed in South Africa by men who envelop themselves in ostrich skins, and admirably imitating the manners of the ostrich, approach it near enough for their purpose, without exciting its alarm, and sometimes kill one after another with their poisoned arrows.

The strength of the ostrich is such that it can easily carry two men on its back.

The voice of the ostrich is deep and hollow, not easily distinguished, except by a practiced ear, from the roar of the lion. It also more frequently makes a kind of cackling; and when enraged and striking violently at an adversary, hisses very loudly.

The flesh of the ostrich is not unpalatable when it is young, but rank and tough when old. It is generally believed to have been prohibited as unclean to the Jews (Lev. xi. 16), although the name is translated *owl* in the English Bible. There are frequent references to it in the Old Testament.

The eggs of the ostrich are much esteemed as an article of food by the rude natives of Africa, and are acceptable even to European travelers and colonists. Each egg weighs about three pounds, and is thus equal to about two dozen ordinary hen's eggs. The egg is usually dressed by being set upright on a fire, and stirred about with a forked stick, inserted through a hole in the upper end. The thick and strong shell is applied to many uses, but particularly is much employed by the s. African tribes for water-vessels. The reader will probably recollect the interesting plate in Livingstone's *Travels* of women filling ostrich shells with water. In taking ostrich eggs from the nest the s. African is careful not to touch any with the hand, but uses a long stick to draw them out, that the birds may not detect the smell of the intruder, in which case they would forsake the nest; whilst otherwise, they will return and lay more eggs.

The long plumes of the ostrich have been highly valued for ornamental purposes from very early times, and continue to be a considerable article of commerce, for the sake of which the ostrich is pursued in its native wilds. See Ostrich-Farming.

The ostrich is often to be seen in America in confinement, and readily becomes quite tame and familiar, although still apt to be violent towards strangers. Great numbers were exhibited in the public spectacles by some of the Roman emperors; and the brains of many ostriches were sometimes presented in a single dish, as at the table of Heliogabalus

OSTRICH-FARMING. Attempts are being made to increase the supply of ostrich feathers, or to facilitate the procuring of them by establishing farms—inclosures where the birds can grow and breed in tameness. In 1859 the bulletin of the Société d'Acclimatation contained a note from Dr. Vavasseur discussing the question whether the ostrich of South America, the nandu (q.v.) or *rhea*, can be acclimatized in France. When caught they are easily tamed; and this is the circumstance which has suggested the idea of naturalization. They must not be placed in cages, but must have free range to walk about, secured simply by a leg-guard. Dr. Vavasseur expressed an opinion "that the South American ostrich could live without difficulty in the n. of France; that there is no difficulty in domesticating it; and that it will feed on almost anything that is given to it, however coarse."

Since 1882, ostrich-farming has been tried in Southern California, though the ultimate success of the experiment is not yet assured. In that year some twenty birds were brought to Placentia by Dr. Sketchly, and there placed upon a farm, the number being increased a little later by the importation of fifteen more. In August of the same year a second farm was stocked near the village of Norwalk. Other farms were established at Fullerton, West Fallbrook, Los Feliz, Santa Barbara, Santa Monica, and Red Bluff. In 1891 the number of ostriches on the different farms amounted to nearly 470. Of this total only 70 birds were imported from Africa, the rest having been hatched upon the farms. Some interesting figures have been published relating to the expenses and receipts of several of the farms. From these it appears that the average cost of an ostrich in Africa is $100, there being an export duty of $50 on each, and a probable loss during the voyage of 20 per cent. of the birds. The ostriches are first plucked when seven months old; at fourteen months the feathers are of excellent quality; and at twenty-one months they are at their best. The value of the annual plucking ranges from $70 to $200, the average being $100. A mature bird is worth $500, one valuable quality being its long life, 80 years being no great age for an ostrich. The chicks are hatched with incubators. The feathers, which are when first plucked brown and gray, must be dyed or bleached, curled, and otherwise made up before being put upon the retail market. At the farms plumes sell for prices ranging from $1.50 to $7 apiece. The birds can be plucked once in seven months. Upon the farm they are divided into trios, one male and two females, each trio requiring about two acres of land. For general details regarding the rearing of ostriches, the reader is referred to Martin's *Home Life on an Ostrich Farm* (1890).

OSTRICH FEATHERS are occasionally borne as a heraldic charge, and always represented drooping. Three white ostrich feathers are the well-known badge of the prince of Wales. According to common tradition they were assumed in consequence of Edward the Black Prince having plucked a plume of ostrich feathers from the casque of John of Luxemburg, king of Bohemia, who fell by his hand at Crecy. There is, however, no doubt that ostrich feathers were previous to that time a cognizance of the Plantagenets. Prince Henry, eldest son of James I., first established the present arrangement of the three ostrich feathers within a prince's coronet.

OSTRICH FERN, *Struthiopteris*, a genus of ferns whose fertile fronds have somewhat the appearance of an ostrich plume. There is but one species (*S. Germanica*) known in America, which is also a native of Europe. There is probably another species in Japan. The American species thrives best in northern latitudes in alluvial soil. The sterile fronds are often 5 ft. and more in height, pinnate, the pinnæ pinnatifid, all growing in a close, circular tuft from the thick and scaly matted rootstocks, forming a beautiful vase-like cluster. Within the circlet of rootstocks arise the fertile fronds, about two-thirds the length of the sterile ones, having the margins of their pinnæ rolled backwards so as to form a somewhat necklace-shaped or continuous hollow cylinder inclosing the fruit. There are from three to five pinnate free veinlets from each primary vein, each bearing on its middle a fruit dot. Sporangia borne on an elevated receptacle, which is half encircled at its base by a delicate semicircular indusium.

OSTROG. (Russian). A dungeon in which the political prisoners of the most dangerous class are confined in Siberia.

OSTROG, a small district t. of w. Russia, in the government of Volhynia, 90 m. w. of Zhitomir. Here, in the reign of Constantine of Ostrog, a school and typography were established, and the first Slavonic Bible printed in 1558. Pop. 17,100.

OSTROGOTHS. See Goths.

OSTROK', the name of a convent in Montenegro, near Herzegovina, noted from its occupying a large cave in the side of a precipice 400 ft. in height. In the various Montenegrin insurrections or wars it has often been made use of as a fortress or store-house for powder and ammunition.

OSTROLE'KA, a district t. in the Polish government of Lomza, 22 m. w.s.w. of Lomza and on the Narew river. It is noted as having been the scene of two battles, the first in 1807, when the Russian gen. Essen was defeated by the French under Savary, and the second in 1831, when the Polish insurgents under the lead of Skrzynecki were overwhelmed by the Russians. The present pop. of the town is about 7,500.

OSTROWS'KY MOUNTAINS, a central range of the Carpathian mountains, of volcanic formation. Sitna is the highest peak, 3,498 ft. high. The rivers Eipel, Sajo, and Gran flow at the base of its slopes and separate it from other portions of the main range.

OSTU'NI, a city of s. Italy, in the province of Lecce, 19 m. w.n.w. from Brindisi on the railway between Ancona and Brindisi. It stands on a steep hill. A considerable trade is carried on, chiefly in the produce of the neighborhood, and the city is a flourishing one. Pop. 18,200.

OSU'NA, a t. of Spain in the province of Seville, 33 m. e.s.e. of the city of that name, stands in a fertile plain, and on a triangular hill crowned by a castle and the collegiate church. It stands in the midst of a highly fertile plain, productive in grain, olives, almonds, etc. An extensive panoramic view is obtained from the castle. The collegiate church, in the mixed Gothic and cinque-cento style, was built in 1534. It was pillaged by Soult of 5 cwt. of ancient church plate, and was converted by him into a citadel and magazine. Pop. comm. 19,400, who are engaged in agriculture and in the manufacture of linen goods, and iron and earthenware.

OSU'NA, Pedro Tellez y Giron, Duke of, 1579–1624; b. Spain; married in 1598 a daughter of the duke of Alcalá, and took the title of duke of Osuna. He was several times expelled from court, but finally regained favor and was appointed viceroy of Sicily in 1611 and of Naples in 1616. He opposed the establishment of the inquisition at Naples; resisted the attempts of Venice to control the commerce of the Mediterranean; and was recalled in 1620 on suspicion of usurping for himself the government of s. Italy. He was confined in Almedas castle, and died by poison.

OSWALD, Saint, 604–642; king of Northumbria, son of King Ethelfrid. He spent some years an exile in Scotland, during which time he was converted to Christianity. He recovered his kingdom and ascended the throne in 634, having defeated in battle, and killed, Cadwalla, king of Wales. He married Cyneburg, a daughter of Cynegil, a West-Saxon king, and with her assistance introduced the Christian religion among the Anglo-Saxons. He was killed at Maserfield by the king of Mercia, Penda, a heathen, and was canonized by the Roman church. There are numerous legends concerning him, which at one time were very popular in Germany, and were published in book form in 1856 by Zingerle, entitled *Die Oswaldlegende und ihre Beziehung zur deutschen Mythologie*.

OSWALD, Eleazer, 1755–95; b. England; related to Richard Oswald of Auchencruive; he became interested in the American colonies, emigrated to America in 1770; and served as captain under Arnold at Ticonderoga, also at Quebec in 1775, where he assumed command and distinguished himself, Arnold having been wounded. He was Arnold's secretary, and in 1777 was promoted to be lieutenant-colonel in Lamb's artillery regiment, and was commended by Gens. Lee and Knox for his brave conduct at Monmouth. He became a printer and publisher at Philadelphia; also public printer. In all political questions he was a bitter opponent of Hamilton, and challenged him to fight a duel in 1789, but the affair was settled by friends without fighting. He commanded a regiment of artillery in the French army at the battle of Jemappes. Died of yellow-fever in New York.

OSWALD, Richard, 1705–84; b. Scotland; a London merchant, a representative of England at the signing of articles of peace at the close of the revolutionary war. He gave bail in the enormous sum of £50,000 for Henry Laurens. His wife, Mary Ramsey, was celebrated by Robert Burns in his songs.

OSWE'GO, a co. in n. central New York, bounded n. and e. by lake Ontario, s.w. by lake Oneida, and drained by the Oswego, Oneida, and Salmon rivers; intersected by the Delaware, Lackawanna and Western; New York, Ontario and Western, and Rome, Watertown and Ogdensburg railroads; 962 sq. m.; pop. '90, 71,883, chiefly of American birth. The surface is nearly level and adapted to grazing. Hay, oats, lumber, maple sugar, potatoes, and dairy products are the staples. Sandstone suitable for building purposes is found. Co. seat, Oswego.

OSWEGO, city and co. seat of Oswego co., N. Y., on the Oswego river, the Oswego canal, and the Delaware, Lackawanna, and Western, the New York, Ontario, and Western, and the Rome, Watertown, and Ogdensburg railroads; 36 miles n. of Syracuse. A trading post was established here in 1720; the village was incorporated in 1828; and the city was chartered in 1848. The prosperity of the city is due to its exceptional facilities as a port of entry and its manufactories. There are two harbors, an outer one in lake Ontario, and an inner one at the mouth of the river; both are protected by breakwaters, containing large coal trestles, and are defended by Fort Ontario, a garrisoned casemated structure on the e. side of the river. The city is laid out with streets 100 feet wide, crossing at right angles, making the building blocks 400 feet long by 200 feet wide, and contains five public parks. Among the noteworthy buildings are the U. S. government building, State normal school, public hospital, orphan asylum, Gerritt Smith library,

St. Francis' home for orphans, old ladies' home, high school, and city hall. The city has waterworks, supplied by gravity from the Oswego river, electric lights, electric street railroad, national and savings banks, over 15 churches, and daily and weekly newspapers. The city has regular steamer communication with the principal ports on the great lakes, and receives and transships large quantities of coal, grain, lumber, and other commodities. The imports exceed in annual value $800,000, and the exports, $2,000,000. The manufactures include starch, matches, shade cloth, hosiery, boilers and engines, and iron products. Pop. '90, 21,842.

OSWEGO TEA, a name given to several species of *monarda*, particularly *M. purpurea*, *M. didyma* and *M. kalmiana*, natives of North America, because of the occasional use of an infusion of the dried leaves as a beverage. They belong to the natural order *labiatæ*, somewhat resemble mints in appearance, and have an agreeable odor. The infusion is said to be useful in intermittents, and as a stomachic.

OSWESTRY, a thriving market t. and municipal borough of England, in the diocese of St. Asaph, 15 m. n.w. of Shrewsbury. The stone pillars of its ancient gateways still stand in the streets. There are also scanty remains of a castle, said to have been the ancestral seat of Walter Fitzalan, progenitor of the royal house of Stuart, who, during the troubles of the reign of king Stephen, fled hence to Scotland, and became steward to David I., king of Scotland. Oswestry is the center of an extensive agricultural district; it has extensive market-places, and its weekly market for agricultural produce and cattle is very largely attended. There are corn-mills and coal-mines in the vicinity. Oswestry contains the offices and works of the Cambrian company, and is favorably situated as a railway center. Pop. '91, of municipal borough, about 4500. Oswestry is said to derive its name from Oswald, king of Northumbria, slain here in 642. Near the town is Oswald's well, a fine spring of water; and "Old Oswestra," an ancient encampment.

OSYMAN'DYAS, the name of a great king of Egypt, mentioned by Diodorus and Strabo, who reigned, according to these authors, as the 27th successor of Sesostris. He distinguished himself, according to these authors, by his victories, and invaded Asia with an army of 400,000 men and 20,000 cavalry, and conquered the Bactrians, who had been rendered tributary to Egypt by Sesostris. In honor of this exploit, he is said by Hecatæus to have erected a monument which was at once a palace and a tomb, and which, under the name of *Osymandeion*, was renowed for its size and splendor in later times. It was said to be situated in the necropolis of Thebes, or at Gournah, and close to the sepulchres of the concubines of the god Amen Ra. The Osymandeion is generally believed to be represented by the extant ruins of the palace of Rameses III. at Medinet Haboo, though great difficulty has been felt in reconciling the descriptions of its magnificence in ancient writers with the dimensions of the modern relic; and Letronne, in his *Tombeau d'Osymandyas* (Par. 1831), has even ventured to suppose that it was an imaginary edifice invented by the Greeks from their acquaintance with the great palaces of Thebes, but this skepticism is considered extreme. The name of Osymandyas is difficult to recognize amongst the Egyptian kings, the nearest approach to it being one of the Setis, either the 1st or 2d, called after death, Asiri-Meneptah. Others consider Osymandyas the Ismendes of Strabo, or the Mendes of Herodotus. The name of Amenophis may also lie concealed in his name, so much ambiguity pervades the subject.

Diodorus, i. 46–50; Strabo, xvii. p. 8, 11–16; Juvenal, xv. 38; Letronne, *Mem. de l'Inst.* ix. p. 321; Champollion, *Lettres Écrites*, p. 260, 303; Champollion-Figeac, *L'Egypte*, 69, 291, 313–315.

OTA'GO, one of the most recent settlements, but, at the same time, the most prosperous, populous, and likely to become the most influential province of New Zealand (q.v.). Since the re-incorporation of Southland—a portion of its territory which, in 1861, was parted from Otago and raised into a small separate province, an experiment which failed in a short time—it is now the most southern province of South island (see NEW ZEALAND). Otago is bounded on the n. by the province of Canterbury, and on the w., e., and s. by the Pacific ocean; is in length 200 m., 160 m. in breadth, and possesses an invaluable line of coast which measures 400 miles. The entire area is about 15,500,000 acres — 25,487 sq. miles. Pop. in '71, 69,500; in '96, 163,944. The chief rivers are the Waitaki, the Clutha, and the Mataura, all of which flow s.s.e., and are navigable to a greater or less extent. The western regions of Otago remain unsurveyed, but are known to be covered with high, and in many cases snow-capped mountains, stretching along the whole line of coast, and extending inland for upwards of 60 miles. East and n.e. from the Matura river to the shore the surface is well known, and consists of mountain-ranges alternating with valleys, and extending parallel to the sea and to each other as far inland as the valley of the Manuherikia, one of the first affluents of the Clutha. The climate of Otago is exceedingly healthy and invigorating; frost and snow are unknown except in the higher ranges, and rain, though sufficiently abundant to answer the demands of agriculture, does not interfere with outdoor occupations. All the English fruits and flowers, with some trifling exceptions, are grown here to perfection. The northern and interior districts of the province are eminently adapted, as regards both soil and climate, for agriculture as well as cattle-breeding. The western districts are rugged, and covered with forests; but in the eastern regions are many fertile and well-watered

tracts, admirably suited for the production of corn, and the rearing of cattle and sheep. In mineral wealth the province of Otago is remarkably rich. Coal, iron, copper, silver, lead, etc., have been found, and useful earths and clays are abundant. Gold has been found in small quantities in other provinces of New Zealand, as in Auckland and Nelson province; but by far the most important gold-fields of the colony are in the province of Otago. Gold was first discovered here by Mr. Gabriel Read in June, 1861, in a gully, since called Gabriel's gully, on the Tuapeka, an affluent of the Clutha, in a direct line 37 m. w. of Dunedin. Read placed his discovery in the hands of government, and was presented by the provincial council with £500 as a reward. In less than two months from the discovery of gold 3,000 people were at work in the Tuapeka valley, and were obtaining 6,000 oz. a week. From this time gold-mining became a staple employment. A "rush" was made from Australia; Dunedin, formerly the village-capital of the province, now rapidly increased in size and trade, new fields were discovered, and the immigration-lists were immensely swelled. From June, 1861, to June, 1863, 700,000 oz., worth nearly £3,000,000, were obtained. The most productive gold-field hitherto discovered is the Arrow river district, in the vicinity of lake Wakatik. This district was made known in Nov., 1862, and from that time to the end of Oct., 1863, 237,655 oz.—value £955,620—were forwarded to Dunedin by escort. The value of the gold exported from Otago up to the middle of 1880 was £15,818,948; in 1876 it was £487,632. In 1880 the exports amounted in value to £1,989,901; the imports to £1,988,101. Gold, wool, timber, and agricultural produce are the principal articles of export. In agriculture, the chief growths are wheat, oats, barley, potatoes, and hay. In 1880 the extent of land under cultivation, and the amount of these products of the farm, were reported to be as follows: wheat, 53,771 acres, supplying 1,930,000 bushels; oats, 143,165 acres, 6,000,000 bushels; barley, 10,114 acres, 340,000 bushels; potatoes, 5,290 acres, 25,000 tons; hay, 7,592 acres, 11,899 tons. The first band of settlers reached the shores of Otago in the spring of 1848. The capital is Dunedin (q.v.). The population of this city and its suburbs, Roslyn and Caversham, was, in 1886, 45,518. Otago was originally a class colony connected with the free church of Scotland; but the influx of immigrants consequent on the discovery of gold has obliterated its distinctive character.

OTAHEI'TE. See TAHITI.

OTAL'GIA (Gr. *ot*, the ear, and *algos*, pain) is neuralgia of the ear. It occurs in fits of excruciating pain, shooting over the head and face, but it is not accompanied by fever, nor usually by any sensation of throbbing. Its causes and treatment are those of neuralgia generally, but it is particularly caused by caries of the teeth, which should always be carefully examined by a dentist in these cases. When patients complain of *earache*, the pain is far more commonly due to *otitis*, or inflammation of the tympanic portion of the ear, a much more serious affection.

O'TARY, *Otaria*, a genus of the seal family (*Phocidæ*), distinguished from the rest of the family by a projecting auricle or auditory conch (often popularly called "external ear"), and by a very remarkable character, a double cutting edge in the four middle upper incisors. The membrane which unites the toes of the hind-feet is prolonged into a flap beyond each toe. The fore-legs, as if intended exclusively for swimming, are placed further back in the body than in the true seals, giving the otaries the appearance of having a longer neck. The hind-legs are more like the fore-legs than in the true seals.—The SEA-LION (*O. jubata* or *O. Stelleri*) of the northern seas is about 15 ft. in length, and weighs about 16 cwt. It inhabits the eastern shores of Kamtchatka, the Kurile islands, etc., also the Farallone islands and San Francisco bay. It is partially migratory, removing from its most northern quarters on the approach of winter. It is to be found chiefly on rocky coasts and islet rocks, on the ledges of which it climbs, and its roaring is sometimes useful in warning sailors of danger. It is much addicted to roaring, which, as much as the mane of the old males, has obtained for it the name of sea-lion. The head of this animal is large; the eyes very large; the eyebrows bushy; the hide thick; the hair coarse, and reddish; a heavy mass of stiff, curly, crisp hair on the neck and shoulders. The old males have a fierce aspect, yet they flee in great precipitation from man; but if driven to extremities, they fight furiously. Sea-lions are capable of being tamed, and become very familiar with man. They are polygamous, but a male generally appropriates to himself only two or three females. They feed on fish and the smaller seals.—The sea-lion of the southern seas, once supposed to be the same, is now generally believed to be a distinct species, and, indeed, more than one species are supposed to inhabit the southern seas.—The URSINE SEAL, URSINE OTARY, or SEA BEAR (*O. ursina*), is an inhabitant of the northern Pacific. It is scarcely 8 ft. long. The hinder limbs being better developed than in most of the seals, it can stand and walk almost like a land quadruped. The muzzle is prominent, the mouth small, the lips tumid, the whiskers long; the tip of the tongue is bifurcated, the eyes are large, the skin is thick, the hair long, erect, and thick, with a soft underclothing of wool. The food consists of sea-otters, small seals, and fish. The ursine seal is polygamous, a strong male appropriating to himself from eight to fifty females. It swims with great swiftness. It is fierce and courageous. Its skin is much prized for clothing in the regions in which it abounds. As in the case of the sea-lion, it is doubtful if the geographical range of the sea-bear extends to the southern seas, or if it is represented there by a similar species. Several

other species of otary are inhabitants of the Pacific and Southern oceans. The Fur Seal (*O. falklandica*) is one of these. It is found on the Falkland islands, South Shetland, etc. It is of a long and slender form, with broad head, and clothed with a soft, compact, grayish-brown hair, amongst which is a very soft, brownish fur. It is gregarious and polygamous. When South Shetland was first visited, its seals had no apprehension of danger, and unsuspectingly remained whilst their fellows were slain and skinned; but they have since learned to be upon their guard.

OTCHAKOV, a small t. and sea-port of South Russia, in the government of Kherson, surrounded on all sides by a barren steppe, stands at the western extremity, and on the n. shore, of the estuary of the Dnieper, 41 m. e.n.e. of Odessa. It traces its foundation to the very earliest times, and is supposed by some to be the spot where stood the Grecian colony Olbia; by others, to be Tomi, the scene of Ovid's banishment. At the end of the 15th c., the khan of the Crimea built here a strong fortress. Its present name occurs for the first time in 1557. During the Russian wars with Turkey in the 18th c., Otchakov was alternately the property of each, until it was taken by Potemkin in 1788, and definitively annexed to the Russian dominions. The vicinity of Odessa is fatal to the development of foreign commerce at its port. Pop. 6820, the greater part of whom are Jews, and are employed in salting fish for transport to Little Russia.

OTERO, a co. in s.e. Col.; formed from part of Bent ; 2050 sq.m.; pop. '90, 4192. It is drained by the Arkansas river. Co. seat, La Junta.

OTEY. James Hervey, D.D., 1800–63 ; b. Va.; a graduate of the university of North Carolina, Chapel Hill, class of 1820; ordained minister in the Protestant Episcopal church 1825, and the first minister of that faith settled in Tennessee. In 1834 he became bishop of Tennessee, and labored in Mississippi, Louisiana, and Alabama, with great success, among the white population and negroes. Through the s. and s.w. he bore the title of "the good bishop." At the outset of the war of the secession he wrote a letter of remonstrance to the U. S. secretary of state concerning coercive measures on the part of the federal government, which he disapproved, and received a reply that materially changed his views, so that subsequently he acted with the north. He published a number of charges, sermons, speeches, and addresses; *The Unity of the Church; The Ministry; The Apostolical Succession;* and *Three Discourses.*

OTFRIED, a German poet, who was b. in the 9th century. He was a Frank by birth; studied at Fulda till 848; then lived many years in St. Gall, and finally became a monk in a Benedictine monastery at Weissenburg, Alsace. While there he wrote his *Liber evangeliorum,* a poetical paraphrase of the gospels, in four-lined rhymed stanzas. The aim of this poem was to replace the heathenish ballads of the newly converted Germans. It is the first rhymed poem we possess of the 9th c., and is chiefly valuable as a study of the German language of that time. The poem, which was probably written before 868, was first published by M. Flacius (Basle, 1571). A translation into modern German, by Kelle, appeared in 1870. For a historical sketch of this poem, and the poetry of his time, see *Otfried's Evangelienbuch und die übrige Althochdeutsche Poesie Krolingischer Zeit,* by Rechenberg (1862).

OTHMAN, Othoman, or Osman **I.,** surnamed *Al-ghazi* ("the conqueror") the founder of the Turkish power, was b. in Bithynia in 1259. His father, Orthogrul, the chief of a small tribe of Ogûzian Turks, had entered the service of Alla-ed-din Kaikobad, the Seljuk sultan of Iconium, and had rendered important services to that monarch and his successors in their wars with the Byzantines and Mongols. Orthogral dying in 1289, after a rule of more than half a century, his tribe chose his son Osman (i.e., the "young bustard,") as his successor. Othman trod in his father's footsteps; and on the destruction of the sultanate of Iconium in 1299 by the Mongols, succeeded in obtaining possession of a portion of Bithynia. He had previously subjugated many of the neighboring Oguzian chiefs, and this new accession of territory rendered him powerful enough to attack the Byzantines with success. In July, 1299, he forced the passes of Olympus, and took possession of the whole territory of Nicaea, with the sole exception of the town of that name, which resisted his efforts for five years longer. In 1301 he defeated the emperor Andronicus II. at Baphaeon; in 1307 he incorporated the province of Marmara in his dominions; and continued till his death, in 1326, steadily to pursue his plans of conquest. "Othman," says Knolles, "was wise, politic, valiant, and fortunate, but full of dissimulation, and ambitious above measure; not rash in his attempts, and yet very resolute; to all men he was bountiful and liberal, especially to his men of war and to the poor. Of a poor lordship, he left a great kingdom (Phrygia, Bythnia, and the neighboring districts), having subdued a great part of Asia Minor, and is worthily accounted the first founder of the Turks' great kingdom and empire." Othman assumed the title of sultan (though this is denied by many historians) on the extinction of the Iconian sultanate in 1299, held his court at Kara-Hissar, and struck money in his own name. From him are derived the terms Ottomans, Othomans, and Osmanli or Osmanlû, which are employed as synonymous with Turks. See Ottoman Empire.

OTHMAN IBN AFFAN, third caliph of the Moslems, was b. about 574. He belonged to the family of the prophet, and was cousin-german of Abu Soffan. One of the early converts to Islam, he was one of its most zealous supporters, and linked himself still

more strongly to Mohammed by becoming his son-in-law and private secretary. He was elected to succeed Omar in the caliphate in Dec. 644, and a most unworthy successor he proved to be. The Moslem empire, however, continued to extend itself on all sides till the insane nepotism of Othman gave its progress a sudden check. The able and energetic leaders who had been appointed by Omar were superseded by members of his own family, and of that of Abu Sofian; and the consequences were what might have been expected. Egypt revolted, and the caliph was compelled to reinstate Amru in the government of that country, and several other rebellions were only quelled by a similar restoration of the previous governors. Zealous Moslems deeply deplored the folly of their chief, and were indignant at seeing the chair of the prophet occupied by Othmar, while Abu-bekr, and even Omar, were accustomed to seat themselves two steps below it. Emboldened by the knowledge of his vacillating and cowardly disposition, they showered upon him reproaches and menaces; but the bearer of their remonstrances having been bastinadoed by Othman's order, a general revolt ensued. Othman averted the crisis by unconditional submission; but having soon after attempted to put to death Mohammed, the son of the caliph Abu-bekr, the latter made his appearance at Medina at the head of a troop of malcontents, and forcing his way to the presence of Othman, stabbed him to the heart. Othman was of a mild and pacific disposition, but he was at the same time most ambitious of power, though after his accession to supreme authority, he showed himself to be, either from age or natural imbecility, deplorably deficient in those energetic virtues, without which the control of a warlike people and the management of a mighty empire such as that of the Moslems, were utterly impossible. Othman was the first to cause an authentic copy of the Koran to be composed.

OTHO, Marcus Salvius, Roman emperor, was descended of an ancient Etruscan family, and was b. 32 A.D. He was a favorite companion of Nero, who appointed him governor of Lusitania, in which office he acquitted himself creditably. On the revolt of Galba against Nero, Otho joined himself to the former; but being disappointed in his hope of being proclaimed Galba's successor, he marched at the head of a small band of soldiers to the forum, where he was proclaimed emperor, and Galba was slain, 69 A.D. Otho was recognized as emperor over all the Roman possessions, with the exception of Germany, where a large army was stationed under Vitellius. The first few weeks of his reign were marked by an indulgence towards his personal enemies, and a devotion to business, which, though at total variance with his usual habits, excited in the minds of his subjects the most favorable hopes. But the tide of rebellion raised in Germany by Valens and Cæcina during the reign of Galba had by this time gathered strength, and these commanders having prevailed upon Vitellius, who had become a mere good-humored glutton, to join his forces to theirs, the combined army poured into Italy. Otho fortunately possessed several able generals, who repeatedly defeated the rebels; but the prudence of some among them in restraining the enthusiasm of their troops, who wished further to follow up their victories, was unfortunately considered as cowardice or treason, and produced dissensions in Otho's camp. This state of matters becoming known to the generals of Vitellius, encouraged them to unite their armies, and fall upon the forces of Otho. An obstinate engagement took place near the junction of the Adda and the Po, in which the army of Otho was completely routed, and the relics of it went over on the following day to the side of the victor. Otho, though by no means reduced to extremity, resolved to make no further resistance; settled his affairs with the utmost deliberation; and then stabbed himself, April 15, 69 A.D.

OTHO I., second son of Ludwig, king of Bavaria, was b. at Salzburg, June 1, 1815, and on the erection of Greece into a kingdom in 1832, was appointed by the protecting powers king of Greece. Till he attained his majority, the government was intrusted to a regency, which was unable to suppress internal disorder, or counteract the diplomatic intrigues of foreign powers. On assuming the government in 1835 Otho transferred the court from Nauplia to Athens, and passed into law several important measures, which afforded the most lively satisfaction to his subjects. During a visit to Germany in 1836, he married the princess Amalie of Oldenburg. A monetary crisis, provoked partly by false administrative measures, and partly by too prompt demands for repayment on the part of the protecting powers, threw the affairs of Greece into confusion, and materially weakened the king's popularity. A national reaction against the Germanizing tendencies of the court followed, and resulted in 1843 in a military revolution, which was suppressed. Otho now attempted to soothe the general discontent by taking the oath to the new constitution of Mar. 30, 1844, but his efforts were only partially successful. Though the Bavarian ministers were dismissed, the king and his Greek advisers showed the most reactionary tendencies, and attempted in various ways to curtail the privileges which the new constitution had conferred on the people. The equivocal position in which he was placed, in 1853, between the allied powers on the one hand, and his subjects, whose sympathies were strongly in favor of Russia, on the other, greatly increased the difficulties of his situation. The occupation of the Piræus by Anglo-French troops enabled him to restrain the enthusiasm of his subjects; but after their withdrawal in 1857, he was obliged to adopt severe measures against the frontier brigands. His council, too, was composed of men unable or unwilling to support him, and his position became year by year more and more difficult. The strong pro-Russianism of the queen rendered her

for some time a favorite; but the belief that Otho's absolute measures were due to her instigation, turned the tide of popular hatred so strongly against her, that attempts were made on her life. The general discontent at last found vent in insurrections at Nauplia and Syra in 1862, which were soon suppressed. A more formidable insurrection in the districts of Missolonghi, Acarnania, Elis, and Messenia, having for its object the expulsion of the reigning dynasty, broke out in October of the same year, and in a few days extended to the whole of Greece. Otho and his queen fled to Salamis, from which place he issued a proclamation declaring that he quitted Greece to avoid the effusion of of blood, and a provincial government was then established. This government, in Feb., 1863, resigned its executive power to the national assembly, which confirmed its acts, and decreed that Prince Alfred of England had been duly elected king of Greece. On the refusal of this prince to accept the throne, their choice fell on prince William of Schleswig-Holstein-Sonderburg-Glücksburg, the second son of Christian IX., king of Denmark, who under the title of George I., king of the Hellenes, in Sept., 1863, assumed the functions of royalty. Otho died July 26, 1867.

OTHO I., or the Great, son of the emperor Henry I. of Germany, was b. in 912, and after having been early recognized as his successor, was, on the death of his father in 936, formally crowned king of the Germans. His reign was one succession of eventful and generally triumphant wars, in the course of which he brought many turbulent tribes under subjection, acquired and maintained almost supreme power in Italy, where he imposed laws with equal success on the kings of Lombardy and the popes at Rome, consolidated the disjointed power of the German emperors, and established Christianity at many different points in the Scandinavian and Slavonic lands, which lay beyond the circuit of his own jurisdiction. His earliest achievement was a successful war against the Bohemian duke Boleslas, whom he reduced to subjection, and forcibly converted to Christianity; next, the dukes of Bavaria and Franconia were compelled to succumb to his power; the former paying the penalty of his opposition to Otho by defeat and death in battle, and the latter by the confiscation of his territories, which, together with the other lapsed and recovered fiefs of the empire, were bestowed on near and devoted relatives of the conqueror. After subduing the Slavi of the Oder and Spree, for whose Christian regeneration he founded the bishoprics of Havelburg and Brandenburg, driving the Danes beyond the Eider, compelling their defeated king to return to the Christian faith and do homage to himself; and after founding, at the suggestion of his mother's former chaplain, Adeldag, the bishoprics of Aarhuus, Ribe, and Sleswick, which he decreed were forever to be free from all burdens and imposts, he turned his attention to the affairs of Italy. Here he presented himself as the champion of the beautiful Adelheid, the widow of the murdered king Lothaire; and having defeated her importunate suitor, Berengar II. (q.v.), married her, and assumed supreme power over the north of Italy in 951. The wars to which this measure gave rise obliged Otho frequently to cross the Alps; but at length after a great victory gained over the Huns in 955, and the defeat and capture of Berengar, Otho was acknowledged king of Italy by a diet held at Milan; and after being crowned with the iron crown of Lombardy, was, in 962, recognized by pope John XII. as the successor of Charlemagne, and crowned emperor of the west at Rome. Otho lost no time in asserting his imperial prerogatives; and having called a council, effected the deposition of John, whose licentiousness had become a burden to Italy and a scandal to Christendom, and caused Leo VIII. to be elected in his place. Fresh wars were the result of this step. Popes and antipopes distracted the peace of Rome; but through all these disorders Otho maintained the supremacy which he claimed as emperor of the west in regard to the election of popes and the temporal concerns of the Roman territories. His later years were disturbed by domestic differences; for his elder son, Ludolph, and his son-in-law, Konrad of Lorraine, having risen in rebellion against him, through jealousy of his younger son and intended successor, Otho, the empire was distracted by civil war. Although the war terminated in the defeat of the rebels, and the recognition of young Otho as king of the Germans, and his coronation at Rome, in 967, as joint emperor with his father, Otho's favorite scheme of uniting the richly-dowried Greek princess, Theophania, with the young prince met with such contempt from the Greek emperor that his outraged pride soon again plunged him into war. His inroads into Apulia and Calabria, however, proved convincing arguments in favor of the marriage, and Theophania became the wife of young Otho, with Calabria and Apulia for her dowry. Otho died at Minsleben, in Thuringia, in 973, and was buried at Magdeburg, leaving the character of a great and just ruler, who had extended the limits of the empire, and restored the prestige of the imperial power more nearly to the stand which it occupied under Charlemagne than any other emperor. He created the duchy of Carinthia, and the mark-grafdoms of east and north Saxony; appointed counts-palatine; founded cities and bishoprics; and did good service to the empire, in reorganizing the shaken foundations of its power in Europe. See Vehse's *Leben Kaiser Otho's des Grossen* (Dresd. 1827).

OTHO II., surnamed *Rufus*, "the red," son of Otho I., was b. in 955, and succeeded his father in 973. For a time Otho was content to rule under the regency of his mother, the empress Adelheid; but differences having arisen between them, through the headstrong and ambitious inclinations of the young monarch, his mother withdrew from all

share in the administration, and left him to the exercise of his own will, which soon brought him into collision with the great vassals of the crown. Civil war broke out under the leadership of Henry II. of Bavaria, who formed a secret alliance against the young emperor with Harold, king of Denmark, and Micislav of Poland, and for a time fortune inclined to the side of the rebels; but Otho's astuteness circumvented their designs, and after defeating Henry, and depriving him of his duchy, he marched against the Danish king, who had been making successful incursions into Saxony. Otho's first attack on the Dannevirke having proved of no avail, he retired, vowing that he would return before another year and force every Dane to forswear paganism. Otho kept his promise, returning to the attack the following year, when, according to the old chroniclers, acting by the advice of his ally, Olaf Trygvesen of Norway, he caused large quantities of trees, brush-wood, and stubble to be piled up against the Dannevirke, and set on fire, and this drove away the defenders, and destroyed their fortifications. The defeated Harold was soon overpowered by the superior numbers of the Germans, and compelled to receive baptism, as the badge of his defeat. The next scene of war was Lorraine, which the French king, Lothaire, had seized as a former appanage of his crown; but here, after a partial defeat, Otho succeeded in reasserting his power; and not content with this advantage, devastated Champagne, pursued and captured Lothaire and advanced upon Paris, one of the suburbs of which he burned. Scarcely was this war ended when the disturbed condition of Italy called Otho across the Alps. His presence put a stop to the insurrection at Milan and Rome, where he re-established order; and having advanced into lower Italy, he defeated the Saracens, drove back the Greeks, and having re-established his supremacy in Apulia and Calabria, which he claimed in right of his wife, Theophania, made himself master of Naples and Salerno, and finally of Tarentum, in 982. The Greek emperor, alarmed at the successful ambition of Otho, called the Saracens again into Italy, who gave him battle with overwhelming numbers. The result was the total defeat of the emperor, who only escaped from the hands of the victors by plunging with his horse into the sea, and swimming, at the risk of his life, to a ship. Unluckily it was a Greek ship, and Otho was virtually a prisoner; but as the vessel neared Rossano, a friendly port, he contrived to escape by a cunning stratagem. Otho now hastened to Verona, where a diet was held, which was numerously attended by the princes of Germany and Italy, and at which his infant son, Otho, was recognized as his successor. This diet is chiefly memorable for the confirmation by Otho of the franchises and privileges of the republic of Venice, and the enactment of many new laws, which were added to the celebrated Longobard code. Otho's death at Rome, at the close of the same year, 983, arrested the execution of the vast preparations against the Greeks and Saracens, which had been planned at the diet of Verona, and left the empire embroiled in wars and internal disturbances. See Giesebrecht's *Jahrbücher des Deutschen Reichs unter der Herrschaft, Kaiser Otho's II.* (Berl. 1840).

OTHO III., who was only three years old at his father's death, was at once crowned king of the Germans at Aix-la-Chapelle in 983, from which period till 996, when he received the imperial crown at Rome, the government was administered with extraordinary skill and discretion by three female relatives of the boy-king—viz., his mother, Theophania; his grandmother, Adelheid; and his aunt, Matilda, abbess of Quedlingburg, who, in conjunction with the learned Willegis, archbishop of Mainz, directed his education. The princes of the imperial family disputed the right of these royal ladies to the custody of the young king; and Henry of Bavaria, the nearest agnate, having seized the person of Otho, tried to usurp the supreme power; but opposed by the majority of the other princes of the empire, he was compelled to release him, in consideration of receiving back his forfeited duchy. Otho early showed that he had inherited the great qualities of his forefathers, and when scarcely 15 years of age, at the head of his army, defeated the troops of the patrician Crescentius, the self-styled consul of Rome, and thus restored order in the Roman territories. In 996 he was crowned emperor by his relative Gregory V.; and having settled the affairs of Italy returned to Germany, where he defeated the Slaves, who had long carried on war against the empire; and having forced Micislav, duke of Poland, to do him homage, he subsequently raised the Polish territories to the rank of a kingdom, in favor of Micislav's successor, Boleslas. The renewed rebellion of Crescentius, who drove Gregory from the papal throne, compelled Otho to return to Italy, where success, as usual, attended his measures. Crescentius, who had thrown himself into St. Angelo, was seized and beheaded, together with twelve of his chief adherents; the antipope, John XVI., imprisoned; Gregory restored; and on the speedy death of the latter, Otho's old tutor, Gherbert, archbishop of Ravenna, raised to the papacy under the title of Sylvester II. Otho elated with his success, took up his residence in Rome, where he organized the government, erected new buildings, and showed every disposition, notwithstanding the ill-concealed dissatisfaction of the Romans, to convert their city into the capital of the western empire. The near approach of the year 1000, to which so many alarming prophesies were then believed to point as the end of the world, induced Otho to undertake a pilgrimage to the Holy Land, where he founded an archbishopric. On his return, after visiting Charlemagne's grave at Aix-la-Chapelle, and removing the consecrated cross.

suspended from the emperor's neck, he again repaired to Rome, to consolidate his schemes of establishing a Roman empire. The insurrection of the Romans frustrated his plans, and escaping from Rome at the risk of his life, he withdrew to Ravenna, to await the arrival of powerful re-enforcements from Germany: but before they had crossed the Alps, Otho died in 1002, at the age of 22, apparently from poison, which was said to have been administered to him by the widow of Crescentius, who, it is said, had deliberately set herself to win his affections that she might have an opportunity of avenging the death of her husband; and with him the male branch of the Saxon imperial house became extinct. See Wilman's *Jahrbücher des Deutschen Reichs unter Kaiser Otto III.* (Berl. 1840).

OTHO IV., 1182–1218; b. Germany; son of Henry the Lion, duke of Bavaria, and Matilda, sister of Richard Cœur-de-Lion. He was duke of Saxony in 1197, when the emperor Henry VI. died, leaving an infant heir, Frederick II. Otho was supported by the Guelphs as a candidate for the throne, while the Ghibellines supported Philip duke of Swabia. A civil war of eight years resulted, which ended by Otho's flight to England, where he took refuge with his uncle, king John of England. Philip remained on the throne till 1207, when he was assassinated, and Otho returned; his claims were recognized by Innocent III., who crowned him at Rome in 1209. Innocent had refused to perform the act of coronation, till Otho swore to give up to the church the right to the nomination to certain benefices. The emperor broke his oath, and was excommunicated by the pope. About the same time the German princes deposed Otho, in favor of the lawful heir, Frederick II., king of Sicily and Naples. After an unsuccessful struggle Otho withdrew to his estates in Brunswick, where he passed the last part of his life in penitential exercises.

OTIC GANGLION, one of the four cephalic sympathetic ganglia, the other three being Meckel's, the ophthalmic and the submaxillary (q.v.). The otic, or Arnold's ganglion, is a small oval, flattened mass of reddish-gray color situated immediately below the foramen ovale. See SKULL, Vol. XIII. It is connected with the inferior maxillary nerve, by which it obtains its motor root, and with the auriculo-temporal nerve, from which it derives its sensory root. Its communication with the sympathetic is by a filament from a plexus which surrounds the middle meningeal artery. This ganglion also communicates with the glosso-pharyngeal and facial nerves. It distributes branches to the tensor muscle of the tympanum, and to the tensor muscle of the palate.

OTIDÆ, a group of birds, usually classed as a family, but in this work as a genus, *otis*, comprising the bustards (q.v.).

OTIS, GEORGE ALEXANDER, b. Mass., 1830; studied at Princeton, and at the university of Pennsylvania, after which he went to Paris and London to study surgery, remaining two years. In 1853 he published the *Virginia Medical Journal*, and in 1861 became a surgeon in the army; in 1864 he served under the surgeon-gen. at Washington. In 1867 he published an article on *Amputation of the Hip Joint*, and in 1869, *Excisions of the Head of the Femur for Injury*. In 1871 he collated a *Report of Surgical Cases Treated in the Army of the U. S.* from 1867 to 1871, and later was appointed curator of the army medical museum. His collections and reports have great value. He d. 1881.

OTIS, HARRISON GRAY, 1765–1848; b. Boston; nephew of James. He was educated at Harvard college, admitted to the bar in 1786, and 10 years later represented Boston in the Massachusetts house of representatives. He entered congress in 1797 as the successor of Fisher Ames, and remained for two terms a recognized leader of the federal party. In 1801 he became U. S. district attorney for Massachusetts from 1803 to 1805; he was speaker of the state house of representatives, and president of the state senate 1805–11. In 1814, as chairman of a committee of the legislature, he made a report advising a general convention of the New England states, to devise some method of relief for the disaster brought upon them by the war with Great Britian. See HARTFORD CONVENTION. He took an active part in the proceedings of that convention, at its sessions in Hartford, and was one of the commissioners sent to Washington by Massachusetts to lay the case of the New England states before the federal authorities. In 1814 he became an associate justice of the state court of common pleas, resigning in 1818 to enter the U. S. senate. He was elected mayor of Boston in 1829. In the senate he opposed the further extension of slavery, distinguishing himself in the discussion of the Missouri compromise. He was as strongly opposed to abolition, and the antislavery agitation, as to the extension of slavery. He published, in 1824, *Letters in Defense of the Hartford Convention*. He left public life in 1832.

OTIS, JAMES, 1702–78; b. Mass.; son of Judge John. He did not receive a college education, but studying law, rose to a high rank in his profession. He was prominent in the disputes between the colonies and the crown, and a warm advocate of the rights of the former. He was elected to the legislature in 1758, and was its speaker for the sessions of 1760 and 1761, when Bernard the royal governor, interposed his negative. Otis asked Bernard for the place of associate justice, on the death of Chief-justice Sewall in 1760, but was refused. In 1763 Otis was made probate judge of Barnstable co., and the next year chief-justice of the common pleas; about the same time he was chosen a member of the council, and speaker of the house. Bernard refused to ratify

his election, and Otis was re-elected and negatived every year till 1770. Hutchinson, then lieut.gov., sanctioned the election in that year. During the first years of the revolutionary war Otis was senior member and president of the council.

OTIS, JAMES, 1725–83; b. Great Marshes, now West Barnstable, Mass.; graduated at Harvard college in 1743; studied law, and was admitted to the bar in 1748. He at first practiced at Plymouth, but settled in Boston in 1748. In 1761, when he was advocate general, the point came up for argument, whether persons engaged in carrying out the acts of trade were entitled to receive assistance from the executive departments of the colony. Otis was convinced of the illegality of the writs of assistance, and resigned rather than argue in their defense. He was immediately engaged to argue against them, which he did in an argument of great force and eloquence: the judges reserved their decision, but no more writs were enforced, though some were issued. The resignation of Otis, and his plea in behalf of the popular side of the writs-of-assistance controversy, gave him a high reputation for ability and eloquence, which he more than maintained in the legislature, to which he was elected next year. He soon came to be regarded the ablest leader of the popular party in Massachusetts. June 6, 1765, he made a motion which was carried, that a congress of representatives from the various colonies should be convened. In pursuance of this measure a circular letter was sent, inviting the colonies to join in a congress, and the stamp act congress, which met in New York, in the fall of 1765, was the result. Otis took part in the proceedings of this body, and served on the committee which framed an address to the house of commons. He was chosen speaker of the legislature in 1767, but the governor interposed his negative. In 1768, after the passage through parliament of Charles Townshend's bill for the taxation of the colonies, the Massachusetts house of representatives sent a second circular letter to the other colonies, calling on them to join in some common plan for protection. It was in answer to the message of Bernard, the royal governor, demanding that the circular be recalled, that Otis made a notable speech, condemned by the partisans of the crown, as "the most violent, insolent, abusive, and treasonable declaration that perhaps was ever delivered." Only 17 members voted to recall the circular. In 1769 the customs commissioners accused him in England, of treason. This coming to the notice of Otis, in the summer of 1769, he publicly denounced the commissioners, in the Boston *Gazette*. Meeting Robinson, one of the commissioners, in a coffee-room the next night, became involved in a dispute with him. An affray was the result, in which Otis was severely handled, and received a cut on the head, which is supposed to have been the cause of his subsequent insanity. He sued Robinson, and recovered £2,000 damages. He relinquished this sum, however, in consideration of a written apology from Robinson. After a short residence in the country for the benefit of his health, he returned to the legislature in 1771. He was insane for the greater part of his life subsequently, with the exception of a short interval, when he went back to Boston and resumed the practice of his profession. The last two years of his life were spent at Andover, and there he was killed by lightning, while standing at the door of his house. He published in 1760, a treatise on *The Rudiments of Latin Prosody*; *A Vindication of the Conduct of the House of Representatives*, 1762; *The Rights of the British Colonies Asserted*, 1764; and *Considerations on Behalf of the Colonists*, 1765.

OTIS, JOHN, 1657–1727; b. Mass.; represented the t. of Barnstable in the legislature for 20 years. He was chief justice of the common pleas, the first judge of probate for Barnstable co., and commander of the co. militia. He sat in the council from 1706 till his death.

OTITIS, or inflammation of the tympanic cavity of the ear, may be either acute or chronic, and it may come on during the course of certain febrile affections, especially scarlatina, or in consequence of a scrofulous, rheumatic, or gouty constitution; or it may be excited by direct causes, as exposure to currents of cold air, violent syringing or probing, etc. The symptoms of the acute form are sudden and intense pain in the ear, increased by coughing, sneezing, or swallowing, *tinnitus aurium*, or singing or buzzing noises heard by the patient, and more or less deafness. If the disease goes on unchecked, suppuration takes place, and the membrane of the tympanum ulcerates, and allows of the discharge of pus, or inflammation of the dura mater, and abscesses in the brain may be established. In less severe cases there is usually a considerable amount of persistent damage, and an obstinate discharge of matter (*otorrhea*) is a frequent sequence of the disease.

The treatment of so serious an affection must be left solely in the hands of the medical practitioner.

The symptoms of the chronic and less acute varieties of otitis are unfortunately so slight, that they are often neglected, until the patient finds the sense of hearing in one or both ears almost completely gone. In these milder forms of otitis, the general indications of treatment are to combat the diathesis on which they frequently depend, and to improve the general health. Very small doses of mercury continued for a considerable time (such as one grain of gray powder night and morning), and small blisters occasionally applied to the nape of the neck or to the mastoid process, are often of service in very chronic cases. If there is any discharge, the ear should be gently syringed once or twice a day with warm water, after which a tepid solution of sulphate of zinc (one grain

to an ounce of water) may be dropped into the meatus, and allowed to remain there two or three minutes.

OT'LEY, a parish and t. of England, in the West Riding of Yorkshire, on the right bank of the Wharfe, 8½m. n.n.e. of Bradford. Its parish church was built in 1507. Extensive cattle and grain markets are held here. Worsted spinning and weaving, machine-making, and the manufacture of malt, bricks, and leather, are the main occupations. Pop. parl. div., '91, 67,100.

O'TOE, a co. in s.e. Nebraska, adjoining Iowa, bounded on the e. by the Missouri river, watered by the Little Nemaha river and its branches, and traversed by the Burlington route and the Missouri Pacific railroads; about 609 sq. m., pop. '90, 25,403. The surface is diversified and heavily timbered. The soil is fertile. The principal productions are corn, wheat, oats, hay, and barley. Co. seat, Nebraska City.

OTOES, or OTTOES, one of the eight tribes of southern Sioux Indians, known first by the French, who called them Otontanta. They live upon the land watered by the Missouri river, and claim to have gone there with the Winnebagoes. For a long time they lived in the region of the Platte river, in a village of earth-covered huts. They made treaties with the whites in 1817 and 1825. They were originally a part of the Missouris, and for some years past they have been joined to them, both tribes living in the same village. The total number in the two tribes was less than 500 in 1885. The Otoes adhere to their original customs and dress, and the efforts of Christian missionaries have produced no special results.

OTO'LITHUS, a genus of fishes of the family *Sciænidæ* (q.v.), having a perch-like form, a convex head, with cellular bones, feeble anal spines, no barbels, long curved teeth or *canines* among the other teeth. A valuable species of this genus is the WEAK-FISH, or SQUETEAGUE (*O. regalis*), which is common on the eastern coasts of North America, from the gulf of Mexico to the gulf of St. Lawrence, and attains a length of 2 feet. It coasts only in the warmer part of the year. It swims in shoals near the surface, takes bait greedily, and may be readily taken by any soft bait. It enters the mouths of rivers where the water is brackish. The flesh is pleasant, but soon gets soft. Excellent isinglass is made of the air-bladder.—A number of species of Otolithus are found in the East Indian seas, some of which are valuable for the isinglass which is made from their air-bladder, and some are much used as food, both fresh and dried.

OTOMIS, or OTHOMIS, the most widely scattered and oldest known of all Mexican tribes, inhabiting the states of Queretaro, Guanaxuato, and Hidalgo, small bands of them also being found in Puebla, Vera Cruz, San Luis Potosi, and Michoagan. They occupied the valley of Mexico until the time of the incursion of the Toltecs, who vanquished them and forced them to the mountains; years later they recovered their possessions. They were afterwards driven out by the Aztecs, who were not able, however, to hold the territory acquired. Gen. Zarazo was sent to conquer them in 1686, but was defeated and killed in the Sierra Gorda. Ardela reduced them to submission in 1715. They were a rude people, but learned something of civilization from their conquerors; and Conni, one of their chiefs and the founder of Queretaro, became a convert to Christianity. They have usually submitted to Spanish rule, and many of them are now numbered among the Mexican citizens and speak the Spanish language as well as their own, which is considered the harshest and most guttural of Indian dialects, and has been thought by many to be a kindred language to the Chinese.

OTORRHEA signifies a purulent or muco-purulent discharge from the external ear. It may be due to various causes, of which the most frequent is catarrhal inflammation of the lining membrane of the meatus, and the next in frequency is otitis (q.v.) in its various forms. If the discharge is very fetid, a weak solution of chloride of lime, or of Condy's disinfectant fluid, may be used in place of the solution of sulphate of zinc recommended in article OTITIS; and in obstinate cases of catarrhal inflammation of the lining membrane, the discharge may often be checked by penciling the whole interior of the meatus with a solution of five grains of nitrate of silver in an ounce of water.

OTRANTO (the ancient *Hydruntum*), seaport town on the s.e. coast of the province of the same name, 24 m. s.e. of Lecce. During the latter period of the Roman empire, and all through the middle ages, it was the chief port of Italy on the Adriatic, whence passengers took ship for Greece—having in this respect supplanted the famous Brundusium of earlier times. In 1480 it was taken by the Turks, and at that time it was a flourishing city of 20,000 inhabitants; but it has long been in a decaying condition, principally on account of malaria. Otranto possesses a castle and cathedral. Its harbor is unsafe. In clear weather the coast of Albania is visible from Otranto. Pop. 2,000–3,000.

OTRANTO, DUKE OF. See FOUCHÉ.

OTRA'NTO, TERRA DI, now called LECCE, the extreme south-eastern province of Italy, forming the heel of the Italian boot, is bounded on the n.w. by the provinces of Bari and Basilicata, and surrounded on all other sides by the sea. Area, 2623 sq. m.; pop. '95, (est.) 647,051. It occupies the ancient Iapygian or Messapian peninsula, and is 102 m. in length, and from 25 to 35 m. in breadth. Three parts of its surface are covered with hills, offsets from the Apennines of Basilicata. All the rivers are short, many of

them being lost in the marshes of the interior; but abundant springs and heavy dews render the soil surprisingly fertile. Good pasture-lands and dense forests occur. The climate is pleasant and healthy, except along the shores, both on the e. and w. coasts, and in the vicinity of the marshes, which in summer generate malaria. An abundance of best wine, with corn and olive-oil, are produced; tobacco (the best grown in Italy), cotton, and figs, almonds, oranges, etc., are also produced. The capital is Lecce (q.v.).

OTSEGO, a co. in the n. part of the s. peninsula of Michigan; drained by the Cheboygan and Au Sable rivers, both of which rise in small lakes of the co.; traversed by the Michigan Central railroad; 540 sq. miles. The surface is rolling and fairly fertile, but not well developed. Pop. '90, 4272. Co. seat, Gaylord.

OTSEGO, a co. in s.e. central New York; drained by the Unadilla river, its n. boundary, the Susquehanna, which takes its rise in lake Otsego, and several less important streams; traversed by the Cooperstown and Charlotte Valley, and the Delaware and Hudson railroads; 956 sq.m.; pop. '90, 50,861, chiefly of American birth. The surface is uneven. Large forests of oak, beech, elm, sugar-maple, and other trees cover about one-fourth of its extent. Hops, oats, potatoes, and dairy products are the staples. The Onondago building limestone is found in abundance. Co. seat, Cooperstown.

OTSEGO LAKE, in Otsego co., N. Y., abounding in fish; 7½ m. long, 1½ m. wide; 1193 ft. above the level of the sea. High hills surround the greater portion of the lake; the waters are clear, and the scenery is picturesque. It empties into a fork of the Susquehanna river, which rises near. Cooperstown is at the s. end of the lake near its outlet.

OT'TAWA, one of the largest rivers of British North America, rises in lat. 48° 30′ n., long. 80° w., in the watershed on the opposite side of which rise the St. Maurice and Saguenay. After a course of above 600 m., it falls into the St. Lawrence by two mouths, which form the island of Montreal; and the entire region drained by it and its tributaries measures about 80,000 sq.m. (*Geol. Rep.* for 1845–46, p. 13). During its course, it widens into numerous lakes of considerable size, and is fed by many important tributaries, such as the Mattawa, Mississippi, Madawasca, and Rideau on the right, the Gatineau and the rivières du Moine and du Lièvre on the left side. These, with the Ottawa itself, form the means of transit for perhaps the largest lumber-trade in the world, while the clearances of the lumber have opened the country for several thriving agricultural settlements. The navigation has been greatly improved, especially for timber, by the construction of dams and slides, to facilitate its passage over falls and rapids. The Ottawa is already connected with lake Ontario at Kingston by the Rideau canal; and there is every prospect of its becoming, before many years, the great highway from the north-western states to the ocean by being connected with the Georgian bay in lake Huron through the French river, lake Nipissing, and the Mattawa. This great engineering achievement, for which capital will undoubtedly be soon forthcoming, would place the western lake ports by water 760 m. nearer to Liverpool by Montreal than by New York through the Erie canal, and would save nearly a week in time, while it would lessen considerably insurance and freight charges.—The Ottowa possesses one of the few literary associations of Canada. At St. Ann's, a few miles above its mouth, the house is pointed out where Moore wrote the Canadian boat-song.

OTTAWA, a co. in n. central Kansas, drained by the Solomon and Saline rivers; 720 sq.m.; pop. '90, 12,581, chiefly of American birth. The surface is rolling, and the soil fertile. The principal productions are corn, potatoes, wheat, oats, and hay. Co. seat, Minneapolis.

OTTAWA, a co. in w. Michigan, adjoining lake Michigan, watered by Grand, Black, and Pigeon rivers, on the Chicago and West Michigan, Detroit, Grand Haven and Milwaukee, and Lake shore railroads; 570 sq.m.; pop. '90, 35,358. The surface is rolling and well wooded, and the soil fertile. The principal productions are corn, wheat, oats, potatoes, maple-sugar, and wool. There are flour and saw mills, and manufactories of carriages, leather, etc. Co. seat, Grand Haven.

OTTAWA, a co. in n.w. Ohio, bordering on lake Erie and Sandusky bay, traversed by the Lake Shore and Michigan Southern railroad, and drained by the Portage river; 311 sq.m.; pop. '90, 21,974. The soil is fertile and the surface slightly hilly, with extensive forests of hickory, beech, ash, elm, and oak trees. Several of the islands in lake Erie are included in the county, and produce large quantities of grapes used in wine manufacture. Wheat, corn, wool, wine, and lumber are leading products; raising cattle and butter-making are among the business interests. Silurian limestone is found here and exported. There are carriage and harness manufactories, flour mills, and 22 saw mills. Co. seat, Port Clinton.

OTTAWA, a co. in n.w. Quebec, having the Ottawa river for its s. boundary, separating it from Ontario; 5,705 sq. m.; pop. '91, 63,560. It is drained by Grand, White, Fish, and other lakes, and the Petit Nation, Lievre, Gatineau, and numerous smaller rivers. It is intersected by the Northern Colonization railway. The rivers furnish extensive water-power, which is utilized to some extent, and trade is rapidly increasing. It contains iron mines, and mines of graphite are worked in the vicinity of Buck-

ingham. The Ottawa river at Hull is spanned by a suspension bridge over Chaudière falls, connecting it with the city of Ottawa, and steamers running on the Upper Ottawa start from Aylmer. It has axe factories, carding and woolen mills, and manufactures of lumber, matches, pails, and wooden-ware. Co. seat, Hull.

OTTAWA, city and co. seat of Lasalle co., Ill.; at the junction of the Fox and Illinois rivers, on the Illinois and Michigan canal and the Chicago, Rock Island, and Pacific and the Burlington Route railroads; 85 miles s.w. of Chicago. It contains Pleasant View college (Luth.), St. Francis Xavier academy, Reddick library, Ryburn memorial hospital, supreme court house, township high school, business college, national banks, electric light and street railroad plants, Washington and Allen parks, and manufactories of glass ware, pottery, fire brick, tile, and pianos and organs. Pop. '90, 9,985.

OTTAWA, city and co. seat of Franklin co., Kan.; on the Marais des Cygnes river and the Atchison, Topeka, and Santa Fé, and the Missouri Pacific railroads; 58 miles s.w. of Kansas City. It is the seat of Ottawa university (Baptist), and has a Santa Fé hospital, public library, high school, Chautauqua assembly, Forest park, national and state banks, gas and electric lights, about 20 churches, daily and weekly newspapers, railroad machine shops, and numerous industrial plants. Pop. '90, 6,248.

OTTAWA, city, capital of the Dominion of Canada, and co. seat of Carleton co., Ontario; at the junction of the Ottawa and Rideau rivers, on the Rideau canal and the Canadian Pacific, the Canadian Atlantic, and several other railroads; 120 miles w.n.w. of Montreal. It was founded in 1827 by Col. By, from whom it was named Bytown; was incorporated as a city under its present name in 1854; and was selected by Queen Victoria as the capital of Canada in 1858. At the w. end of the city, the Ottawa rushes over the magnificent cataract known as the Chaudière falls; and at the n.e. end there are two other cataracts, over which the Rideau tumbles into the Ottawa. The scenery around Ottawa also is scarcely surpassed by any in Canada. The immense water-power at the city is made use of in several saw-mills, which give Ottawa its principal trade, and issue almost incalculable quantities of sawed timber. A suspension bridge hangs over the Chaudière falls, connecting upper and lower Canada. The city is in communication by steamer on the Ottawa with Montreal; on the Rideau canal with lake Ontario at Kingston; and with the principal points of the province by means of the St. Lawrence and Ottawa and the various railroad lines. The government buildings are magnificent structures built of Canadian and New York sandstone, cover nearly four acres, and cost about $4,000,000. The style of architecture is the Italian Gothic, and the s. front of the quadrangle is formed by the parliament building, 500 feet long. The buildings are on Barrack hill, 125 feet above the river. Pop. '91, 44,154.

OTTAWAS, an Algonquin tribe who, when first visited by the French explorers, lived in n.w. Michigan, and on the Manitoulin islands. The tribe then consisted of the Keinouches, Kiskakons, and Sinagos. They were worshipers of the water-god Mirabichi, and of the creator Michabou, "the great hare." On the fall of the Hurons in 1649, that portion of the Ottawas living in the Manitoulin islands, and at Saginaw, crossed the Mississippi, and reached the Sioux territory, from which they soon withdrew, after a war with the Sioux, to Mackinaw. Soon after the foundation of Detroit, a part of the tribe took up lands near that point, while the Mackinaw Ottawas went to Arbre Croche. The tribe had always been friendly to the French, and, at the close of the last French war, the Detroit Ottawas joined the conspiracy against the English, which was planned by their chief Pontiac. The whole tribe then counted 1500 persons. They adhered to the English in the revolutionary war, after the close of which they were parties to the treaties of fort MacIntosh in 1785, and fort Harmar in 1789. After allying themselves with the Miamis in a short war against the Americans, they made a final treaty of peace in 1795. They soon united with the Ojibways and the Pottawattamies, and in successive treaties ceded large tracts of land to the United States, reserving for themselves a tract on the Miami, with an area of about 1200 sq. miles. A treaty of 1833 ceded the Michigan lands to the United States in exchange for a tract s. of the Missouri river. In 1836, the Ottawas at Maumee, Ohio, ceded 49,000 acres of their Ohio lands. The same year the Michigan Ottawas gave up all their lands outside of the reservations. Part of the Maumee Ottawas settled in 1836 upon a tract of 34,000 acres s. of the Osage river. There they founded a prosperous farming community, and had schools and a Baptist mission. In 1862 each family was allotted 160 acres, and 20,000 acres were reserved for schools; and in 1867 they were made citizens of the United States. In 1870 they removed to a reservation of nearly 25,000 acres in the Indian territory, n. of the Shawnees. They number about 130. The Michigan Ottawas live among the Chippewas along the shores of lake Superior. The number of both tribes is between 4,000 and 5,000. There is another branch of the Ottawas in Canada.

OTTENDORFER, OSWALD, b. Zwittau, Moravia, 1826; law student at Prague and Vienna; became a resident of New York in 1850, and an editor of the *New Yorker Staats-Zeitung* until the death of Mr. Uhl, the proprietor, when he became manager, under his supervision this paper has become the leading German-American daily: it was for some years an advocate of the democratic party, but since 1871 has been inde-

pendent in politics. Mr. Ottendorfer, as president of the German reform association, labored zealously in exposing the corruption then existing in the city government. He served as alderman, 1872–74, when he was nominated as independent candidate for mayor, and defeated; Mr. Ottendorfer established, 1884, a branch of the New York free circulating library, in a handsome building, thoroughly fitted. His wife, well known for her charities, having begun the erection of a handsome building for a free German dispensary, her husband finished it after her death; and it was presented, May, 1884, to the German dispensary of New York. He also presented his native city with a public library, an orphan asylum, and a public hospital.

OTTER, *Lutra*, a genus of quadrupeds of the weasel family (*mustelidæ*), differing widely from the rest of the family in their aquatic habits, and in a conformation adapted to these habits, and in some respects approaching to that of seals. The body, which is long and flexible, as in the other *mustelidæ*, is considerably flattened; the head is broad and flat; the eyes are small, and furnished with a *nictitating membrane;* the ears are very small; the legs are short and powerful; the feet, which have each five toes, are completely webbed; the claws are not retractile; the tail is stout and muscular at its base, long, tapering, and horizontally flattened; the dentition is very similar to that of weasels; six incisors and two canine teeth in each jaw, with five molars on each side in the upper, and five or six in the lower jaw; the teeth are very strong, and the tubercles of the molars very pointed, an evident adaptation for seizing and holding slippery prey. The tongue is rough, but not so much so as in the weasels. The fur is very smooth, and consists of two kinds of hair—an inner fur very dense and soft, intermixed with longer, coarser, and glossy hair. The species are numerous, and are found both in warm and cold climates. The Common Otter (*L. vulgaris*) is a well-known British animal, rarer than it once was in most districts, but still found in almost every part of the British islands, and common also throughout the continent of Europe, and in some parts of Asia. It often attains a weight of 20 to 24 lbs. Its length is fully 2 ft., exclusive of the tail, which is about 16 in. long. The color is a bright rich brown on the upper parts and the outside of the legs, being the color of the tips of the long hairs, which are gray at the base; the tips of the hairs in the soft inner fur are also brown, the base whitish-gray; the throat, cheeks, breast, belly, and inner parts of the legs are brownish-gray, sometimes whitish, and individuals sometimes, but rarely, occur with whitish spots over the whole body; the whiskers are very thick and strong; the eyes are black. The otter frequents rivers and lakes, inhabiting some hole in their banks, generally choosing one which already exists, and seldom, if ever, burrowing for itself. It also inhabits the sea-shore in many places, and swims to a considerable distance from the shore in pursuit of prey. Its movements in the water are extremely graceful; it swims with great rapidity in a nearly horizontal position, and turns and dives with wonderful agility. Its prey consists chiefly of fish, and, like the other *mustelidæ*, it seems to take pleasure in pursuing and killing far more than it can eat; and in this case it daintily feeds on the choicest part, beginning behind the head of the fish, and leaving the head and often much of the tail part. The otter, however, when fish cannot readily be obtained, satisfies the cravings of hunger with other food, even snails and worms, and attacks small animals of any kind, sometimes making depredations in places far from any considerable stream. The otter produces from two to five young ones at a birth. The flesh of the otter has a rank fishy taste, on which account, perhaps, it is sometimes used in the Roman Catholic church, as *fish*, by those whose rules forbid them the use of flesh.—Otter-hunting has long been practiced in Britain, although now chiefly confined to Wales and Scotland. Hounds of a particular breed—otter hounds—are preferred for it. The otter defends itself with great vigor against assailants. The otter can be easily domesticated, and trained to catch fish for its master. In India, tame otters—probably, however, of another species to be afterwards noticed—are not unfrequently used both for catching fish, which they bring ashore in their teeth, and for driving shoals of fish into nets.—The fur of the otter is in some request, but more on the continent of Europe than in Britain.—The American Otter or Canada Otter (*L. Canadensis*) is very like the common otter, but considerably larger. The tail is also shorter, and the fur of the belly is almost of the same shining brown color with that of the back. The species is plentiful in the northern parts of North America. Its skin is a considerable article of commerce, and, after being imported into England, is often exported again to the continent of Europe. It is usually taken by a steel-trap, placed at the mouth of its burrow. Its habits are very similar to those of the otter of Europe.—The Indian Otter (*L. Nair*) has a deep chestnut-colored fur, and yellowish-white spots above the eyes.—The Brazilian Otter (*L. Braziliensis*) is said to be gregarious.—Somewhat different from the true otter is the Sea Otter or Kalan (*L. marina*, or *enhydra lutris*), an animal twice the size of the common otter, a native of Behring's straits and the neighboring regions, frequenting sea-washed rocks. There are, at least in the adult, only four incisors in the lower jaw, and the ears are set lower in the head than in the true otters, below, not above, the eyes. The tail is also much shorter. The under teeth are broad, and well adapted for breaking the shells of mollusks and crustaceans. The hind-feet have a membrane skirting the outside of the exterior toes. The sea otter is much valued for its fur, the general hue of which is a rich black, tinged with brown above, and passing into lighter colors below. The head is sometimes almost white.

OTTERBEIN, PHILIP WILLIAM, 1726–1813; b. in Germany; studied theology, and was ordained in the Reformed church at Herborn, 1749. He was sent to the United States as a missionary in 1752 by the Holland synod, and settled at Lancaster, Penn., and after acting as pastor in several other places went to Baltimore in 1774. Here he remained until his death, and the church which he founded was the first of the denomination known as the United Brethren in Christ, which in 1893 numbered 208,452. Mr. Otterbein was a man of great learning, and very liberal in his associations with Christians of other sects than his own, frequently co-operating with the Methodists in open-air meetings and itinerant tours.

OTTERBEIN UNIVERSITY, the first educational institution of the United Brethren in Christ; was founded 1847 at Vesterville, near Columbus, O. It has three buildings, including a women's dormitory and a conservatory of music. Two courses are offered, the classical and the philosophical, and there are post-graduate, art, music, and normal departments. In 1896 there were 18 instructors, 270 students, and a library of 7,500 volumes. President since 1892, Thos. J. Sanders.

OTTERBURN, BATTLE OF. See CHEVY CHASE.

OTTER TAIL, a co. in w. central Minnesota, drained by the Red river of the North and Leaf and Pelican rivers, and containing several lakes, the largest, Otter Tail lake, being about 12 m. long; others are Pelican, Pine, Battle, and Rush lakes; traversed by the Northern Pacific and the Great Northern railroads; 2200 sq. m.; pop. '90, 34,232, chiefly of American birth. The surface is part prairie and part woodland. Oats, wheat, hay, and potatoes are the staples. Co. seat, Fergus Falls.

OTTO, a tp. in M'Kean co., Penn. Pop. '90, 2429.

OTTO, LOUIS WILLIAM, 1754–1817; Count of Mosloy; b. in Baden, Germany, educated at Strasbourg; entered diplomatic service, and was an *attaché* of the chevalier Luzerne in the French mission to the United States in 1779, first as secretary, and afterward as *chargé d'affaires* until 1792; married a daughter of the Livingston family; was employed by the committee of public safety in Paris in 1793 as a friend of the Girondists, and when they fell was imprisoned until released by the overthrow of Robespierre; was afterward in diplomatic positions at Berlin, London, and Vienna, and negotiated the marriage of Napoleon I. with Maria Louisa in 1809. He died in Paris.

OTTO (or ATTAR) OF **ROSES** is the volatile oil or otto (see PERFUMERY) of the petals of some species of rose. It is a nearly colorless or light yellow crystalline solid at temperatures below 80° F., liquefying a little above that temperature. It is imported from the e., where in Syria, Persia, India, and Turkey, roses are cultivated to a considerable extent for its sake. It is probable that the oriental otto is the produce of more than one species of rose; and it is uncertain what species is cultivated in some of the localities most celebrated for it; but *rosa Damascena* is known to be so employed in the n. of India, and a kind of otto is sometimes obtained by the makers of rose-water from *rosa centifolia* in England. See ROSE. To procure the otto, the rose petals are usually distilled with about twice their weight of water, and the produce exposed to the cool night-air in open vessels, from which the thin film of otto is skimmed with a feather in the morning. Twenty thousand flowers are required to yield otto equal to the weight of one rupee, which even in India is worth about 100 rupees, or fifty dollars. Otto is said to have been first procured by what may be called an accidental distillation of rose-petals exposed with water to the heat of the sun, and to have been found floating on the surface of the water; and it is still sometimes obtained in India by such a process. It is said to be also obtained by dry distillation of rose-petals at a low temperature. During the distillation of rose-petals, a small quantity of a solid volatile oil comes over (solid oil of roses, see below), which crystallizes and floats on the water in the receiver, and which is sometimes called *English oil of roses*. Otto of roses is not unfrequently adulterated with sandal-wood oil, oil of rhodium, etc. It is much used for making hair-oil, a drop of it being enough to impart a pleasant odor to a considerable quantity. It is also used in making lavender-water and other perfumes. The odor of otto itself is too powerful to be altogether pleasant. Another method of obtaining the *scent* of roses is described in the article PERFUMERY. Otto of roses is a mixture of two volatile or essential oils; the one solid at ordinary temperatures, and the other liquid. The solid oil of roses (rose camphor, stéaroptène of oil of roses) exists separately in crystalline plates, melts or fuses at 203° F., and boils at about 592°. It possesses of itself very little odor, is insoluble in alcohol, but soluble in ether. It is composed of carbon and hydrogen. The liquid oil of roses (eléoptène of oil of roses) is a very fragrant liquid, to which the otto of roses is indebted for its delicious perfume, and appears to consist of carbon, hydrogen, and oxygen; though its composition and properties have not been attentively studied. The otto of roses may be regarded as a solution of one part of the solid oil in two parts of the liquid. To separate these oils, the otto is frozen at a temperature below 80° F., and the congealed mass pressed between folds of blotting-paper, which absorbs the liquid oil of roses, and leaves the solid. Another process which may be resorted to is to treat the frozen otto with alcohol, which dissolves the liquid oil, and leaves behind the solid. The otto of roses has a specific gravity of 832, water being 1000; it is combustible; and when its vapor is diffused through oxygen, and set fire to, a violent explosion takes place: 1000 parts of alcohol dissolve 7 parts of the otto in the cold, and 33 parts when slightly heated. The principal use to which otto of roses is put is as a perfume. Milk of roses and lavender-water owe their fragrance to the presence

of the otto. A good receipt for oil for the hair is olive oil, colored by alkanet, and scented by a few drops of otto, and this is very generally sold under the name of otto of roses. Medicines are occasionally perfumed by otto of roses, and it is sometimes added to unguents and spirit-washes.

OTTOCAR II., King of Bohemia, 1230–78; son of Wenceslas I., against whom, when a young man, he led a revolt of the Bohemian nobility; but his father defeated and imprisoned him. He was soon released, and at the age of 23 married Margaret, the widowed duchess of Austria, aged 46, who brought him Austria and Styria as her dower. He came to the Bohemian throne on the death of his father, and the next year organized a crusade against the heathen Prussians, whom he defeated; and he founded Königsberg in their territory. In 1260 he gained a victory over the Hungarians on the Marchfield, and annexed some of their dominions. He procured a divorce from Margaret, and married Princess Cunigunda of Hungary in 1261. The duchies of Carniola and Carinthia fell to him in 1269, and his kingdom then comprised the territory between the Baltic and the Adriatic, and between the Inn and the Raab. Upon the death of Richard of Cornwall, he became a candidate for the imperial throne in 1273; but both he and Alfonso of Castile, who had also offered himself for the vacancy, were passed over in favor of Rudolph of Hapsburg. Ottocar refused to recognize the latter, and in the war that ensued was defeated; and Rudolph, before the walls of Vienna, 1276, forced from him the renunciation of Carniola, Carinthia, Austria, Styria, and the Windish territory. Soon afterward Ottocar, again attacking Rudolph, was killed at the battle of Jedenspeng. He founded schools, promoted commerce and agriculture, and sought to weaken the power of the feudal nobility.

OTTOMAN EMPIRE, or "Empire of the Osmanlis," comprehends all the countries which are more or less under the authority of the Turkish sultan, and includes, besides Turkey in Asia, and that part of Turkey in Europe which is under his immediate sovereignty, the vassal principalities of Moldavia and Wallachia (i.e., Roumania), Servia, and Montenegro, in Europe; Egypt with Nubia, Tripoli, and Tunis, in Africa; and a part of Arabia, including the holy cities of Mecca and Medina, in Asia. The special description, topography, history, etc., of these countries will be found under their own heads, and this article will consist solely of a brief sketch of the origin, growth, and present state of the Ottoman empire.

The Ottomans, or Osmanlis, to whom the generic epithet of *Turks* is by common usage now confined, are the descendants of the Ogûzian Turks, a tribe of the great Turkish nation, which in the 13th c. inhabited the steppes e. of the Caspian sea. The tide of Mongol invasion which was then setting in from the n.e., swept the Oguzes before it, and they, to the number of 50,000, under their chief, Suliman, fled westward to the mountainous region of Armenia. After the chief's death, the majority of the tribe became scattered over Mesopotamia; but a few thousands under Orthoguel, his youngest son, marched westward to aid the Seljuk sultan of Konieh against the Khaurezmians and Mongols, and received from the grateful monarch a grant of land in Phrygia.—His son, Othman (q.v.) (1288–1326), laid the foundation of the independent power of the Turks; and Othman's son and successor, Orkhan (1326–59), continued the same aggressive policy, and gained a footing in Europe by the taking of Gallipoli, Koiridicastron, and other fortresses on the coast. The Greeks, with the usual contempt of civilization for barbarism, made light of these losses, saying that the Turks had only taken from them a "hogs' sty" and a "pottle of wine," in allusion to the magazines and cellars built by Justinian at Gallipoli; but, as the historian Knolles quaintly remarks, "by taking of such hog-stys and pottles of wine, the Turks had gone so far into Thracia that Amurath, a few years later, placed his royal seat at Adrianople." Sultan Orkhan, perceiving the advantage of possessing a force trained exclusively for war, organized the body of troops known as Janizaries (q.v.), and to these his successor added the Spahis (q.v.) and the Zanis.—Amurath I. (1359–89), the successor of Orkhan, rapidly reduced the Byzantine empire within the limits of Constantinople and some neighboring districts in Thrace and Bulgaria. A formidable confederacy of the Slavonian tribes of the upper Danube was formed against him, and, supported by multitudes of warriors from Hungary and Italy, they advanced into Servia to give him battle; but their army, amounting, it is said, to 500,000 men, was defeated with dreadful slaughter at Kossova (1390); and though the sultan was assassinated on the eve of the battle, his son, Bajazet I. (q.v.) (1389–1403), followed up this victory by ravaging Servia and Wallachia. Moldavia was also overrun, and a second crusading army, under the king of Hungary, totally routed at Nicopolis (1396); but the defeat and capture of the sultan by Timur (q.v.), gave Constantinople a respite for half a century, by raising up numerous claimants for the Turkish throne; and it was not till 1413 that Bajazet's youngest son, Mohammed I. (1413–21), established his claim to the scepter. A war which broke out with the Venetian republic at this time produced the most disastrous consequences to the mercantile and maritime interests of the Turks, and internal disorders prevented any aggressions on their neighbors.—Amurath II. (1421–51), a prince of considerable ability, completed the conquest of the Greek empire by reducing Macedonia and Greece proper; and finding that the Hungarians had concluded a secret treaty of offense and defense with the Turkish sultan of Caramania against him, he attacked the former, but was defeated by Hunyadi (q.v.),

and compelled to retreat. Disheartened at his ill success, he resigned the throne; but on receiving news of a formidable invasion by the army of the papal crusade, resumed the direction of affairs, and totally defeated the invaders, with whom were Hunyady (q.v.) and Scanderbeg (q.v.), at Varna (1444).—Mohammed II (q.v.) (1451–81), the sworn foe of Christianity, greatly enlarged the Turkish territories. It was he who stormed Constantinople in 1453, and destroyed the last relic of the empire of the Cæsars.—His son, Bajazet II. (1481–1512), extended his dominions to the present limits of the Turkish empire in Asia and Europe, including, however, also the country to the n. of the Black sea, as far e. as the mouth of the Don, portions of Dalmatia, and Otranto in Italy. Bajazet was the first to feel the evil effects of the military organization of sultan Orkhan, but all his attempts to get rid of his formidable soldiery were unsuccessful. He attempted the invasion of Egypt, but was totally defeated by the Mameluke sultan at Arbela (1493).—His successors, Selim I. (q.v.) (1512–20) and Solyman I. (q.v.) (1520–66), raised the Ottoman empire to the height of its power and splendor. During their reigns no ship belonging to a nation hostile to the Turks dared then navigate the Mediterranean, so completely did their fleets command that sea.—Selim II (1566–74), a pacific prince, put an end to a war with Austria, which had been commenced in the previous reign, by a peace in which it was stipulated that the Emperor Maximilian II. should pay a tribute of 30,000 ducats annually for the possession of Hungary, and that each nation should retain its conquests. During his reign occurred the first collision of the Turks with the Russians. It had occurred to Selim that the connection of the Don and Volga by a canal would, by allowing the passage of ships from the Black sea into the Caspian, be a valuable aid to both military and commercial enterprise, and accordingly he sent 5,000 workmen to cut the canal, and an army of 80,000 men to aid and protect them. But, unluckily, the possession of Astrakhan formed part of the programme, and the attack of this town brought down on the Turks the vengeance of the Russians, a people till then unknown in southern Europe, and the projected canal-scheme was nipped in the bud. The rest of this sultan's reign was occupied in petty wars with Venice, Spain, and his rebellious feudatory of Moldavia.—His son, Amurath III. (1574–95), such was then the prestige of the Turks, dictated to the Poles that they should choose as their king Stephen Bathory, Woiwode of Transylvania; and received the first English embassy to Turkey in 1589, the object of the embassy being to conclude an alliance against Philip II. of Spain. To this the sultan agreed; but the destruction of the Spanish armada soon after rendered his interference unnecessary.

After an exhausting, though successful, war with Persia, succeeded a long contest with Austria, in which the Turks at first obtained the most brilliant success, penetrating to within 40 m. of Vienna, but afterward suffered such terrible reverses that they were compelled to evacuate all Hungary and Transylvania (hitherto a feudatory), and were only saved from destruction by the Poles, who entered Moldavia, and drove out the Transylvanians and Hungarians, thus affording the Turks an opportunity of rallying, and even recovering some of their losses. The latter part of this war happened during the reign of Mohammed III. (1595–1603), and afforded unmistakable symptoms of the decline of Turkish prowess; and a rebellion of the pasha of Caramania, in Asia, which was quelled not as a Mohammed II. or a Bajazet I. would have quelled it, but by yielding to the pasha's demands, afforded an equally convincing proof of the growing weakness of the central administration, and set an example to all ambitious subjects in future. During the reigns of Achmet I. (1603–17), Mustafa (1617–18, 1622–23), Othman II. (1618–22), and Amurath IV. (1623–40), Turkey was convulsed by internal dissensions, nevertheless, a successful war was waged with Austria for the possession of Hungary; but this success was more than counterbalanced in the e., where shah Abbas the great conquered Mesopotamia, Kurdistan, and Armenia; and in the n., where the Poles took possession of some of the frontier fortresses. While Amurath was recovering his lost provinces in the e., the khan of the Crimea, countenanced by the Poles, and Russians, threw off his allegiance. Mustafa, the grand vizier, a man of great ability and integrity, continued to direct the helm of government under Ibrahim (1640–48); took from the Poles their conquests; and in a war with the Venetians (1645) obtained Candia and almost all the Venetian strongholds in the Ægean sea, though with the loss of some towns in Dalmatia.—Mohammed IV. (1641–91) commenced his reign under the most unfavorable auspices; he was only seven years of age, and the whole power was vested in the janizaries and their partisans, who used it to accomplish their own ends; but luckily for Turkey, an individual of obscure birth, named Mohammed Köprili, supposed to be of French descent, was, when over 70 years of age, appointed vizier; and the extraordinary talents of this man proved to be the salvation of Turkey at this critical juncture. He was succeeded (1661) in office by his son Achmet, a man of equal ability, and under his guidance the central administration recovered its control over even the most distant provinces; a formidable war with Germany, though unsuccessfully carried on (1663), was concluded by a peace advantageous to the Turks; Crete was wholly subdued, and Podolia wrested from the Poles; though, shortly afterwards, much of this last acquisition was reconquered by John III. (q.v.). Achmet's successor overran the Austrian territories, and laid siege to Vienna; but the siege was raised, and his army defeated by a combined army under the duke Charles of Lorraine and John Sobieski, king of Poland. The Austrians followed up this victory by repossessing themselves of Hungary,

inflicting upon the Turks a bloody defeat at Mohacz (1687); but the fortunate appointment of a third Köprili as grand vizier by Solyman II. (1687–91) was the means of restoring glory and fortune to the Turkish arms.—The reigns of Achmet II. (1691–95), and Mustafa II. (1695–1703), were occupied with wars against Austria; but with the death of Köprili (1691) fortune deserted the Turks, and the peace of Carlowitz (1699) forever put an end to Turkish domination in Hungary.—Achmet III. (1703–30) was forced by the intrigues of Charles XII. (q.v.) of Sweden, while residing at Bender, into a war with Russia; a step which was immediately followed by an invasion of Moldavia by the czar Peter. The czar, imprudently relying on the aid of the woiwode of Moldavia, found himself in great straits, from which he was rescued by the genius of his queen, afterward Catharine I. The recovery of the Morea from the Venetians, and the loss of Belgrade and parts of Servia and Wallachia, which were, however, recovered during the subsequent reign of Mahmud I. (1730–54), and the commencement of a long war with Persia (see Nadir Shah), were the other prominent occurrences of Achmet's reign. In 1736 the career of Russian aggression commenced with the seizing of Azof, Oczakof, and other important fortresses; but a scheme for the partition of Turkey between Austria and Russia was foiled by the continued series of disgraceful defeats inflicted upon the Austrian armies by the Turks: the Russians, on the other hand, were uniformly successful; but the czarina, becoming very desirous of peace, resigned her conquests in Moldavia, and concluded a treaty at Belgrade. Among the benefits conferred by sultan Mahmud on his subjects, not the least was the introduction of the art of printing.—His successor, Othman III. (1754–57), soon gave place to Mustafa III. (1757–73), under whom the empire enjoyed profound tranquillity; but after his death, the Russians, in violation of the treaty of Belgrade, invaded Moldavia.—The war with Russia continued during the succeeding reign of Abdul-Hamid (1774–89); the fortresses on the Danube fell; and the main army of the Turks was totally defeated at Shumla. The campaign was ended July 10, 1774, by the celebrated treaty of Kutshouk-Kainardji. In defiance of its provisions, the czarina took possession of the Crimea and the whole country east ward to the Caspian. The sultan was compelled, by his indignant subjects, to take up arms in 1787. In 1788 Austria made another foolish attempt to arrange with Russia a partition of Turkey; but, as before, the Austrian forces were completely routed. The Russians, however, with their usual success, had overrun the northern provinces, taken all the principal fortresses, and captured or destroyed the Turkish fleet.—The accession of Selim III. (q.v.) (1789–1808) was inaugurated by renewed vigor in the prosecution of the war; but the Austrians had again joined the Russians. Belgrade surrendered to the Austrians, while the Russians took Bucharest, Bender, Akerman, and Ismail (see Suvorof); but the critical aspect of affairs in western Europe made it advisable for Russia to terminate the war, and a treaty of peace was accordingly signed at Jassy, Jan. 9, 1792. By this treaty the provisions of that of Kainardji were confirmed; the Dniester was made the boundary-line, the cession of the Crimea and the Kuban was confirmed, and Belgrade was restored to the sultan.

Numberless reforms were now projected for the better administration of the empire. The people were, however, hardly prepared for so many changes, and the sultan's projects cost him his throne and life. The occupation of Egypt by the French brought on a war between them and the Turks, in which the latter, by the aid of the British, were successful in regaining their lost territories. In revenge for the defeat of his Egyptian expedition, Napoleon contrived to entrap the sultan into a war with Russia and Britain, which was confined to a struggle in Egypt, in which the British were worsted.—After the ephemeral reign of Mustafa IV. (1807–8), the able and energetic Mahmud II. (q.v.) (1808–39) ascended the throne; and though his dominions were curtailed by the loss of Greece, which established its independence, and of the country between the Dniester and the Pruth, which, by the treaty of Bucharest in 1812, was surrendered to Russia, the reformation he effected in all departments of the administration checked the decline of the Ottoman empire. Egypt, during his reign, attempted unsuccessfully to throw off the authority of the sultan (see Mehemed Ali, Ibrahim Pasha).—His son, Abdul-Medjid (1839–61), continued the reforms commenced in the previous reign; but the czar, thinking that the dissolution of the Ottoman empire was at hand, constantly tried to wring from the sultan some acknowledgment of a right of interference with the internal affairs of the country. It was an attempt of this sort to obtain the exclusive protectorate of the members of the Greek church in Turkey that brought on the "Crimean war" of 1853–55, in which the Turks were effectively supported by England, France, and Sardinia. The treaty of Paris (1856) restored to Turkey the command of both sides of the lower Danube, excluded the czar from his assumed protectorate over the Danubian principalities, and closed the Black sea against all ships of war. The porte, apparently adopted into the family of European nations, made proclamation of equal civil rights to all the races and creeds of the Turkish dominions. But a massacre of Christians in Lebanon and at Damascus provoked western intervention in 1860. Abdul-Medjid, whose last years were disgraced by irrational profuseness of expenditure, was succeeded by his brother Abdul-Aziz in 1861. Meanwhile the nominally subject peoples of Moldavia and Wallachia ventured to unite themselves into the one state of Roumania; and in 1866 the empire, becoming more and more enfeebled through its corrupt administration, had to look on while the Roumanians expelled their ruler, and, in

the hope of securing western support, chose Prince Charles of Hohenzollern to be hereditary prince (*domnu*) of the united principalities. The rebellion of Crete in 1866 threatened a severe blow to the integrity of the empire, but was ultimately suppressed in 1868—in spite of active help from Greece. Servia, already autonomous within her own frontiers, demanded the removal of the Turkish garrisons still maintained in certain Servian fortresses; and in 1867 Turkey saw herself compelled to make this concession. In the same year the sultan distinguished the vali of Egypt by granting to him the unique title of khedive (q.v.). The vassal king drew down the wrath of his suzerain in 1870 by negotiating directly with foreign courts, and was compelled to give formal tokens of vassalage. But later concessions have made the khedive virtually an independent sovereign. The Russian government took the opportunity of war between Germany and France to declare, in 1871, that it felt itself no longer bound by that provision of the Paris treaty which forbade Russia to have a fleet in the Black sea; and a London conference sanctioned this stroke of Russian diplomacy. Between 1854 and 1871 the Turkish debt had increased by more than $580,000,000; and in 1875 the Porte was driven to partial repudiation of its debts. An insurrection in Herzegovina in the latter part of 1874 marked the beginning of a very eventful and critical period in the history of the Ottoman empire. The insurrection smoldered on through 1875 and part of 1876, and excited all the neighboring Slavonic peoples. A threatened revolt in Bulgaria in May, 1875, was repressed with much bloodshed; and the merciless cruelty displayed by the bashi-bazouks or Turkish irregulars alienated foreign sympathy from the government. In May Abdul-Aziz was deposed; and his nephew, Murad V., son of Abdul-Medjid, who succeeded him, was destined in turn to make way for his brother, Abdul-Hamid II., in August of the same year. In June Servia declared war, and Montenegro followed her example. Before the end of the year the Servians were utterly defeated, in spite of the help of many Russian volunteers; but the state of affairs in the Turkish provinces seemed to call for a conference of the great powers at Constantinople. The proposals then made for the better government of the Christian subjects of Turkey were rejected by the Turkish authorities, who had, during the conference, taken the extraordinary step of bestowing a parliamentary constitution on the Ottoman empire. Russia took upon herself to enforce on Turkey the suggestions of the conference, and on April 24, 1877, declared war. Both in Armenia and Bulgaria the opening of the campaign was favorable to Russian arms, but later the Turks rallied and seriously checked the hitherto triumphant progress of the invaders. Even after the Russian forces had been greatly augmented, the Turks resisted energetically. Kars, besieged for several months, resisted till the middle of November; Erzeroum did not surrender until after the armistice had been concluded. Osman Pasha, who established himself in Plevna early in July, repelled with brilliant success repeated and determined assaults from a besieging army of Russians and Roumanians; and he had so strengthened the fortifications as to be able to hold out until Dec. 10, when he surrendered. Desperate fighting in the Shipka pass had failed to expel the Russians from their position in the Balkans; and within a month of the fall of Plevna the Russians captured the whole Turkish army that was guarding the Shipka pass, and then easily overran Roumelia. The victorious Muscovites occupied Adrianople in Jan., 1878; on the last day of that month an armistice was concluded; and in March the "preliminary treaty" of San Stefano was signed. After grave diplomatic difficulties, owing chiefly to the apparent incompatibility of English and Russian interests, a congress of the powers met at Berlin, and ultimately agreed to that solution of the "eastern question," discussed under the article Turkey, which has so seriously affected the area and standing of the Ottoman empire.

OTTUMWA, city and co. seat of Wapello co., Ia.; on Des Moines river and the Iowa Central, the Wabash, the Burlington route and other railroads; 75 miles w. of Burlington. It contains a U. S. government building, Hawkeye and city hospitals, public library, Y. M. C. A. building, high school, normal school, business college, over 25 churches, new court-house, national and state banks, and daily and weekly newspapers. It is the center of rich coal-fields, and has abundant water-power, iron works, oil and starch mills, meat-packing plant, and numerous factories. Pop. '90, 14,001.

OTWAY, Thomas, an English dramatist, was b. Mar. 3, 1652, at Trotton, near Medhurst, Sussex. He left Oxford without taking a degree, and went to London in search of fortune in 1671. He appeared on the stage, but made a signal failure; and next he applied himself to dramatic composition. In 1675 *Alcibiades*, his first tragedy, was printed; and in the following year he produced *Don Carlos*, a play which was extremely popular, and "got more money than any preceding modern tragedy." His first comedy, *Friendship in Fashion*, appeared in 1678, and, being sufficiently immoral to please the taste of the age, met with general appreciation. In 1677 Otway received a cornet's commission in a regiment, which, however, was disbanded in 1678, and Otway, resuming his former occupation, produced the tragedy of *Caius Marius* in 1680. In the same year *The Orphan* met with an extraordinary, and, in some respects, a deserved measure of success. In 1681 *The Soldier of Fortune*, and in the following year the finest of all his plays, *Venice Preserved*, were produced. From this time till his death, the poet had much to endure from poverty and neglect. Debts accumulating upon him, he retired to

an obscure public-house on Tower-hill, for the purpose of avoiding his creditors, and here, at the premature age of 33, he died, April 14, 1685. Although Otway achieved a brilliant reputation during his lifetime, although he is described by Dryden as possessing a power of moving the passions which he himself did not possess, and later by sir Walter Scott as being Shakespeare's equal, if not his superior, in depicting the power of affection; yet his plots are artificial, and his language is without fancy, melody, or polish.

OUACHITA', a co. in s. Arkansas ; drained by the Ouachita river and by the Little Missouri, which bounds it on the n.; 732 sq.m.; pop. '90, 17,033 of American birth, inclu 6254 colored. The surface is in great part covered with forests of white, red, and Spanish oaks ; pine, beech, and hickory. Indian corn, cotton, and pork are the chief products. Co. seat, Camden.

OUACHITA', a parish in n. Louisiana, intersected by the Ouachita river and drained by the bayou D'Arbonne; traversed by the Queen and Crescent route railroad; about 644 sq. m., pop. 17,985, chiefly of American birth, including colored. The surface is hilly, and there is much woodland. The soil is rich; cotton, Indian corn, and pork are the staples. Parish seat, Monroe.

OUDE, or AUDH, a province of British India, separated on the n. from Nepaul by the lower ranges of the Himalaya, whence it gradually slopes to the Ganges, which forms its boundary on the s. and s.w. Extreme length from n.w. to s.e., 270 m., breadth, 160; area, 24,217 sq. miles. Pop. '91, 12,650,831, or 522 to the sq. mile. Oude is one great plain, the slope of which from n.w. to s.e. indicates also the direction of the principal rivers. These are the Gumti, the Ghagra (Ghogra), and the Rapti, which swarm with alligators. The northern part, on the edge of the Himalaya, is not very well known. It forms a portion of the Terai, a vast unhealthy tract stretching along the borders of Nepaul, and covered with impassable forests. The climate of Oude is cool and pleasant from November to March; during the next four months it is hot and sultry, after which follows the long rainy season, but in general it is considered the healthiest along the whole valley of the Ganges. The soil is light, and except small nodules of chalk and oolite called *kankars*, there is hardly a loose stone to be seen. Oude was formerly more copiously watered than it is now, the clearing of the jungles having greatly decreased the moisture of the land. The chief crops are wheat, barley, gram, masure, mustard, rice (of the finest quality), millet, maize, joar, bajra, various kinds of pulse and oil-seeds, sugar-cane, tobacco, indigo, hemp, and cotton. The manufacturing industry of Oude is not important; soda, saltpeter, and salt are the only articles of which more is produced than is requisite for home consumption. Gunpowder, and all kinds of military weapons, guns, swords, spears, shields, and bows of bamboo, or Lucknow steel, are, however, also made, besides some woolen goods, papers, etc. Bridges are few, if any, and the roads in general bad. The principal is the famous military road from Cawnpore to Lucknow, which runs in a north-easterly direction.

The people are of a decidedly warlike disposition. The bulk of the inhabitants are Hindus, though the dominant race for centuries has been Mohammedan. The Brahmans are the most numerous class, but there are 29 different Rajput tribes. It is these two classes that mainly supplied the famous (or infamous) sepoys of the Bengal army. The language spoken is Hindustani.

The most characteristic feature in the social economy of Oude is its *village-system*, for a description of which see INDIA. The *ryots*, or cultivators of the soil, cling to the land which their fathers have tilled for ages with extraordinary affection, and thoroughly believe that they have a right of property in it; and, in general, we believe they are *actually* the owners of their farms, but in many cases they have been dispossessed by a class of tax-gatherers (resembling the Roman *publicani*) called *talukdars*, who farmed from the Mogul, and afterwards from the king of Oude, the revenues of a collection of villages called a *talukah*, and by their extortions so impoverished the ryots or peasant-proprietors, that the latter were often forced to execute deeds transferring their property to the talukdars. Many of the more spirited would not submit to become *tenants*, and taking to the jungles waged war on the new occupants of their ancestral lands, until gradually they sank into *dacoits*, or professional robbers. The extortions of the talukdars continued till the annexation of the country in 1856, and the country suffered severely from the retaliatory raids of the dispossessed ryots. The East India company reinstated the ryots in their property, where the talukdars could not show undisputed possession for 12 years —a proceeding which gave great offense to the latter, who, in consequence, assumed a coldly hostile attitude to the British during the great mutiny of the following year.

The principal towns are Lucknow (q.v.), Fyzabad, Oude, or Ayodha, Roy Bareily, and Shahabad.

Oude is believed by Sanskrit scholars to be the ancient *Kosala*, the oldest seat of civilization in India. The country was conquered by a Mohammedan army in 1195, and made a province of the Mogul empire. In 1753 the vizier of Oude, Saffdar Jung, rebelled against his imperial master, Ahmed Shah, and forced the latter to make the governorship hereditary in his family. His son, Sujah-ud-Dowlah, became entirely independent, and founded a dynasty which ruled the country, generally in a most deplorable manner, until, in the interests of the wretched inhabitants, the East India company was

forced to adopt the extreme measure of annexation, Feb. 7, 1856. The necessity for this high-handed but most beneficent act will be better understood if we read the statistics of crime in Oude during the last years of its independence: one item will suffice—from 1848 to 1854 there were, on an average, no fewer than 78 villages burned and plundered every year, while murders, robberies, abductions, and extortions were every-day occurrences. A feeble king, a blackguard soldiery, and a lawless peasantry had brought about a most helpless and ruinous anarchy. When the mutiny of 1857 broke out, Oude became one of the great centers of rebellion. Upon this, the confiscation of all the estates of the talukdars was proclaimed by lord Canning; but when the country was subdued by force of British arms, the estates of all such as laid down their arms and swore fealty to the British government were restored. The forts of the petty chiefs, however, were dismantled, and the inhabitants disarmed. The province is now administered by a chief commissioner. The chief feature of the present condition of affairs in Oude is the preservation in their integrity of the estates of the talukdars. The amount of government revenue paid by the talukdars is about £1,000,000.

OUDE, or AWADH, one of the principal towns of the province Oude (q.v.), stands amid ruins on a hilly site on the right bank of the Sarayû or Goggra river, 77 m. e. of Lucknow. It is also called *Hanumangá'dhi*, on account of a temple erected there in honor of Hanuman (q.v.), the fabled monkey-ally of Râma, an incarnation of the god Vish'nu. The name Oude is a corruption of the Sanskrit *Ayodhyá* (from *a*, not, and *yodhya*, conquerable, hence "the invincible" city); but the ancient city of that name was situated opposite the modern Oude, where its ruins may still be seen. Ayodhyâ was one of the oldest seats of civilization in India; it was the residence of the solar dynasty, or one of the two oldest dynasties of India, deriving its descent from the sun, but it obtained special renown through Râma, the son of Das'aratha, a king of that dynasty. Its great beauty and immense size are dwelt upon in several of the Purânas and modern poems, but more especially in the *Râmâyan'a* (q.v.), the first and last books of which contain a description of it. According to some Purânas (q.v.). Ayodhyâ was one of the seven sacred cities, the living at which was supposed to free a man from all sin, and the dying at which, to secure eternal bliss. It was also called Sâketa, Kos'alâ, and Uttara-kos'alâ. See Goldstücker's *Sanskrit Dictionary*, under AYODHYÂ. Pop. 12,000.

OUDENAR'DE, a t. in the province of east Flanders, Belgium, is situated chiefly on the e. bank of the Scheldt, 15 m. s.s.w. from Ghent. It has a pop. of 8,000, and possesses a fine Gothic council house, important manufactures of linen and cotton fabrics, and many extensive tanneries. The town was taken by the French, aided by an English force in 1658; it was again besieged in 1674, by the stadtholder, William (III. of England) of Orange; and in 1706 it was taken by Marlborough. An attempt made by the French to retake it brought on the famous battle of Oudenarde, one of Marlborough's most celebrated victories, which was gained on July 11, 1708, with the aid of Prince Eugene, over a French army under the duke of Burgundy and Marshal Villars. After this battle the French king made offers of peace, which were not accepted. Pop. 5,500.

OUDINOT, CHARLES NICOLAS, Duke of Reggio, and Marshal of France, was b. at Bar-le-Duc, in the department of Meuse, France, April 25, 1767. At the age of 17, he entered the army but returned home after three years' service. Having distinguished himself in 1790 by suppressing a popular insurrection in his native district, he was, after some volunteer service, Nov. 1793, raised to the rank of chief of brigade, in the fourth regiment of the line, and distinguished himself in various actions with the Prussians and Austrians. He was wounded and taken prisoner before Mannheim, by the Austrians, but was soon exchanged and served in the armies of the Rhine under Moreau, and in that of Switzerland under Massena. He was promoted to be general of division (April 12, 1799), and for a daring capture of a battery at Pozzola, was presented by the first consul with a saber of honor and the cannon which he had taken. In 1805 he received the grand cross of the Legion of Honor, and about the same time received the command of ten battalions of the reserve, afterwards known as the "grenadiers Oudinot." At the head of this corps he did good service in the Austrian campaign. He was present at Austerlitz and Jena, and gained the battle of Ostrolinka (Feb. 16, 1807), for which he was rewarded with the title of count, and a large sum of money. He greatly contributed to the success of the French at Friedland, and was presented by Napoleon to the Czar Alexander as the "Bayard of the French army, the knight *sans peur et sans reproche.*" He sustained his now brilliant reputation in the second Austrian campaign of 1809, and on July 12 was created marshal of France, and on Aug. 15, duke of Reggio. In 1810 he was charged with the occupation of Holland, and by his unswerving probity and attractive personal qualities, drew the esteem of all classes. He was engaged in the disastrous Russian campaign, and subsequently took part in the various battles of 1813 between the French and the Russians and Austrians. He was one of the last to abandon Napoleon, but he did so forever, and spent the period known as the "hundred days" on his own estates. At the second restoration he became a minister of state, commander-in-chief of the royal guard and of the national guard, and was created a peer of France, grand cross of St. Louis, etc. In 1823 he commanded the first division of the army of Spain, and was for some time governor of Madrid. After the revolution of July 1830, Oudinot retired to his estates, and only at rare intervals presented himself in the cham-

ber of peers. He became grand chancellor of the Legion of Honor in May, 1839, succeeded Marshal Moncey as governor of the Invalides in Oct., 1842, and died at Paris Sept. 13, 1847. A statue was erected in his honor at Bar, Sept. 29, 1850.—His son, NICOLAS CHARLES-VICTOR OUDINOT, duke of Reggio (born Nov. 3, 1791), was a general in the French army. He first distinguished himself in Algeria, and in the revolution of 1848—having previously distinguished himself as a deputy (1842–46) by his admirable talent for dealing with questions affecting the comfort and discipline of the soldiery—he was chosen commander-in-chief of the army of the Alps. In April 1849, he was appointed general of the French expedition against Rome, and forced the city to surrender unconditionally on July 1, in spite of the heroic resistance of the republican triumvirs—Garibaldi, Mazzini, and Saffi. He was, however, not a Napoleonist, and at the *coup d'etat*, Dec. 2, 1851, shared the fate of every eminent general who would not violate his oath to obey the constitution—i. e., he was arrested and imprisoned. He was soon set at liberty and lived in retirement until his death in 1863. Oudinot wrote several books on military matters.

OUIDA. See RAMÉE, LOUISE DE LA.

OUISTITI. See MARMOSET.

OULACHAN. See CANDLE-FISH.

OUNCE. The Latin *uncia* (derived by Varro from *unus*) was the name of the twelfth part of the *as* or *libra* (pound), and also was applied to the twelfth part of any magnitude, whether of length, surface, or capacity. Hence *inch*, the twelfth part of a foot. The modern ounce is a division of the pound-weight. See POUND.

OUNCE, *Felis Uncia* or *Leopardus Uncia*, a large feline animal, nearly resembling the leopard, but having much rougher and longer hair, a longer and much more bushy tail; the general color is also paler, the rosette-like spots are less sharply defined and there is a black spot behind the ears. Little is known of the ounce; it is described by Buffon, but naturalists were for some time generally inclined to regard it as identical with the leopard, and its name has been transferred in South America to the jaguar. It is a native of Asia, and probably of mountainous districts.

OU'RARI. See CURARI.

OURAY, a co. in s.w. Colorado; formed, 1877, from part of San Juan; crossed by Rio San Miguel and Rio Dolores; surface mountainous, Mt. Wilson, a noted summit, having a height of 14,280 ft. Productions: gold, silver, copper, and galena. Forests of fir and pine abound. The valleys are fertile. Pop. '90, 6510. Area, 450 sq. m. Co. seat, Ouray.

OURAY, CHIEF, b. Col. abt. 1820; d. at Los Pinos agency, Col., 1880. He was the eloquent chief of the Uncompahgre Utes, and frequently visited Washington in the interests of his tribe. He was friendly to the government, and though a warrior in his youth, accepted in his old age the conditions of civilization.

OU'RO PRE'TO (black gold), a town of Brazil, capital of the state of Minas Geraes, stands among barren mountains, 4,000 ft. above sea-level, and 180 m. n. by w. of Rio Janeiro. It contains the governor's residence and a college, and consists mainly of narrow and irregular streets. Although the neighboring mountains are very auriferous, and although the mines were once the richest in the kingdom, the mining is now reduced to comparatively unprofitable washings. Pop. 20,000.

OUSE, called also, for the sake of distinction, the NORTHERN or YORKSHIRE OUSE, a river of England, is formed by the union of the Swale and the Ure in the immediate vicinity of the village of Boroughbridge, and flows s.e. past York, Selby, and Goole. About eight m. below the last town, it joins the Trent, and forms the estuary of the Humber. The length of its course from Boroughbridge is 57 m., for the last 45 of which (from the city of York) it is navigable for large vessels. Its principal affluents are the Wharf and the Aire from the w., and the Derwent from the n.e. The basin of the Ouse, or the Vale of York, commences from the northern boundary of the county, near the river Tees, from whose basin it is separated by a low ridge of hills, and extends southward, including almost the whole of the county. See YORKSHIRE.

OUSE, GREAT, a river of England, rises close to the town of Brackley, in the s. of Bedfordshire, and flows n. e. through the counties of Buckingham, Bedford, Huntingdon, Cambridge, and Norfolk, and falls into the Wash at King's Lynn. It is 160 m. in entire length, and is navigable for the latter two-thirds. It receives from the e. and s. the Ivel, Cam, Lark, and Little Ouse.

OUSEL. See OUZEL.

OUSELEY, Sir FREDERICK ARTHUR GORE, b. London, 1825; educated at Oxford. Taking holy orders he became a curate in London, was made precentor of Hereford cathedral, in 1855, and incumbent of St. Michael's, Tenbury, in 1856. He was one of the founders, and later warden of St. Michael's college, Tenbury, an institution for the instruction of boys in classics and choral singing. He took the degree of doctor of music at Oxford, in 1854; and the next year became professor of music there. He published a number of musical collections, *A Treatise on Harmony*, 1869, and *A Treatise on Counterpoint and Fugue*, 1869. He is also the author of a number of anthems, and has edited, with Dr. Monk, *Anglican Psalter Chants*, 1872. He d. 1889.

OUSELEY, Gideon, 1762–1839; b. Ireland; of a family distinguished in English history. He was designed for the government service, and received a liberal education. In his youth he was reckless, but in 1789 became religious under the influence of some Wesleyan soldiers stationed at Dunmore, his native place. He soon became an evangelist, exciting the wonder of the people by his fervor and boldness, preaching in the streets and churchyards, fairs and markets and at the wake-houses. Without dismounting from his horse he preached from three to five times a day. After preaching thus for 7 years he was received into the Wesleyan conference, and in 1799 appointed missionary to Ireland. He was often roughly treated by the Irish, but being a master of the Irish language, and thoroughly acquainted with the Irish character he succeeded in converting thousands. At the age of 74, after 50 years of devoted labor, he was still as active as ever on the high-ways and in the market-places, preaching fourteen, sixteen, and sometimes twenty, sermons a week. "Gideon Ouseley," says Stevens, "will be forever recognized as the Protestant apostle of Ireland." He was the author of several polemical publications, of which the most important is *Old Christianity and Papal Novelties.* So conclusive were his arguments that many Roman Catholic laymen, schoolmasters, and candidates for the priesthood, were converted, some of the latter becoming preachers of the Wesleyan body or of the established church.

OUSELEY, Sir William, ll.d., 1771–1842; appointed cornet of dragoons in 1788, but left the army in 1794, and began the study of the oriental languages at the university of Leyden. He was secretary to his brother sir Gore, ambassador to Persia, 1810–12. He gave an account of his residence in Persia, under the title of *Travels in Persia,* 1819–23. Among his works are *Persian Miscellanies,* 1795; *Oriental Collections,* 1797; *Observations on some Medals and Gems bearing Inscriptions in the Pahlavi or Ancient Persian Character,* 1801; and *Anecdotes from Oriental Bibliography,* 1827.

OUSELEY, Sir William Gore, d.c.l., 1797–1866, b. London; entered the diplomatic service. He was attached to the British legation at Stockholm in 1817, and at Washington in 1825. He held various diplomatic positions at Rio Janeiro, Buenos Ayres, Montevideo and Asuncion, 1832–51. He was afterward employed on special missions, to Central America and the United States. Among his works are *Remarks on the Statistics and Political Institutions of the United States,* 1832; *Notes on the Slave Trade,* 1850; and *Views of South America,* 1852.

OUSTER, in law. See Ejectment, Action of.

OUTAGAMIE', a co. in. e. central Wisconsin, drained by the Fox, Wolf, and Embarras rivers, traversed by the Chicago and Northwestern, the Chicago, Milwaukee and St. Paul, and other railroads; 640 sq. m.; pop. '90, 38,690. The surface is level and in great part woodland. The soil is moderately fertile; wheat, oats, hay, lumber and dairy products are the staples. Co. seat, Appleton.

OUTAGAMIES. See Sacs and Foxes.

OUTCROP, a term applied in geology to the edge of an inclined bed at the place where it rises to the surface. The line of the outcrop is called the strike, which is always at right angles to the dip.

OUTER HOUSE. See Court of Session.

OUTFIT ALLOWANCE, in the British army, is a sum of £150 for the cavalry, and £100 for the infantry, granted to non-commissioned officers promoted to commissions, to enable them to meet the heavy charges for uniform and equipments. The larger sum is given in the cavalry because the newly commissioned officer has to purchase his charger.

OUTLAWRY, in English law, means putting one out of the protection of the law, for contempt in willfully avoiding execution of legal process. Formerly, in the common law courts, if the defender would not enter an appearance, certain proceedings were taken to outlaw him, so as to allow the action to go on without his appearance. These proceedings, however, are now abolished, and, in the majority of cases, it is immaterial as regards the action whether the defendant appear or not, provided he was properly served with the original writ of summons. After judgment he may still be outlawed, as a preliminary to seizing and selling his property. In criminal proceedings, outlawry still exists as part of the ordinary practice to compel a person against whom a bill of indictment for felony or misdemeanor has been found, but who will not come forward to take his trial, and who has not been arrested. In such a case, process of outlawry against him is awarded, which is a kind of temporary judgment; and while this process exists he is out of the protection of the law, and forfeits all his property. The courts will not listen to any complaint or attend to his suit till he reverse the outlawry, which is generally dome as a matter of course.—In Scotland outlawry or fugitation is a similar process, and the defender must first be reponed against the sentence of outlawry before his trial can take place.

In the United States of America the process of outlawry in civil cases does not exist; never having been practised in most of the states, and having long since been abolished in the others. It is possible that it may have been used here in criminal cases, but the instances, if any exist, were of very rare occurrence.

OUTPOSTS are bodies, commonly small, of troops stationed at a greater or less distance beyond the limits of a camp or main army, for the purpose of preventing an enemy approaching without notice, and also to offer opposition to his progress, while the main force prepares for resistance. Outguards march off to their position silently, and pay no compliments of any kind to officers or others. As soon as the officer commanding an outpost arrives on his ground, he proceeds to carefully examine the environs, noting all heights within rifle-range, roads and paths by which an enemy may approach, etc. He also takes such impromptu means of strengthening his position as occur to him—felling a tree here, cutting brushwood there, blocking a path in another place, and resorting to any expedient which may serve to delay the foe at point-blank range—an object of importance, as a stoppage at such a point is known to act as a great discouragement to advancing troops.

OUTRAM, Sir James, Lieut.Gen., G.C.B., Indian soldier and statesman, was b. 1803, at Butterley hall, Derbyshire, the residence of his father, Mr. Benjamin Outram, a civil-engineer of note. His mother, the daughter of James Anderson of Mounie, Aberdeenshire, was descended from Sir W. Seton, lord Pitmedden. Outram was educated at Udny, Aberdeenshire, under the Rev. Dr. Bisset, and afterwards went to Marischal college, Aberdeen. He was sent to India as a cadet in 1819, and was made lieut. and adjutant of the 23d Bombay native infantry. He then took command of and disciplined the wild Bheels of Candeish, and successfully led them against the Daung tribes. From 1835 to 1838 he was engaged in re-establishing order in the Mahi Kânta. He went with the invading army under lord Keane into Afghanistan as aid-de-camp; and his ride from Khelat, through the dangers of the Bolan pass, will long be famous in Indian annals. He became political agent at Guzerat, and commissioner in Sinde, where he made a bold and earnest defense of the ameers against the aggressive policy of Gen. Sir Charles James Napier. He was afterwards resident at Sattara and Baroda, and upon the annexation of Oude, was made resident and commissioner by lord Dalhousie. His health failing, he returned to England in 1856; but when the war with Persia broke out, and it became necessary to send an expedition to the Persian gulf, Outram accompanied the forces, with diplomatic powers as commissioner. He conducted several brilliant and successful operations; the campaign was short and decisive; and the objects of the expedition having been triumphantly attained, he returned to India. Landing at Bombay in July, 1857, he went to Calcutta to receive lord Canning's instructions, and was commissioned to take charge of the forces advancing to the relief of Lucknow. He chivalrously waived the command in favor of his old lieut., Havelock (q.v.), who had fought 8 victorious battles with the rebels, and, taking up only his civil appointment, as chief-commissioner of Oude, tendered his military services to Havelock as a volunteer. Lucknow was relieved, and Outram took the command, but only to be in turn besieged. He held the Alumbagh against almost overwhelming forces, until lord Clyde advanced to his relief. He then made a skillful movement up the left bank of the Gumti, which led to a final and complete victory over the insurgents. He was made chief-commissioner of Oude; and though he had strongly opposed its annexation, he was the man who did most to restore British rule, and attach the people to it. For his eminent services he was appointed to the rank of lieutenant-general in 1858, and received the thanks of parliament in 1860. He took his seat as a member of the supreme council of India, in Calcutta, but sank under the climate, and returned to England in 1860, already stricken by the hand of death. The communities of India voted him a statue at Calcutta, founded an institution to his honor, and presented him with commemorative gifts. A banquet was given to him and his chief and companion-in-arms, lord Clyde, by the city of London. His English admirers determined to erect a statue to his honor in London, and gave him a valuable dessert-service in silver. He spent the winter of 1861–62 in Egypt; and after a short residence in the s. of France, expired at Paris, Mar. 11, 1863. Outram was styled by Sir Charles Napier the "Bayard of India." Than his, there is no more gallant name in the whole list of distinguished Indian soldiers. His services in the east as a soldier and a diplomatist extended over the period of 40 years. He was ever the generous protector of the dark-skinned races among whom his lot was thrown, and set a bright example to all future administrators of moderation, conciliation, humanity, and practical Christianity in all his dealings with the natives of India. See the *Biography* by Sir F. Goldsmid (1880).

OUTRIGGER, in its proper sense, is a beam or spar fastened horizontally to the cross-trees or otherwise, for the purpose of extending further from the mast or topmost, the backstay or other rope by which that mast or topmast is supported. The power of the stay is thus increased. The term is also used improperly—because no "rigging" is in question—to denote the apparatus for increasing the leverage of an oar, by removing the resistance, as represented by the side of the boat (see Oar), further from the power represented by the rower's hand. This is effected by fixing an iron bracket to the boat's side, the row-lock being at the bracket's extremity. The necessary leverage is thus obtained without adding to the width of the boat itself.

OUTWORKS, in fortification, are minor defenses constructed beyond the main body of a work, for the purpose of keeping the enemy at a distance, or commanding certain salient points which it is undesirable that he should occupy. Such works are ravelins, lunettes, hornworks, crownworks, demi-lunes, tenailles, etc. They occur in certain

necessary order, as a ravelin before the curtain and tenaille, a hornwork before a ravelin, and so on.

OUVRARD, Gabriel Julien, 1770–1846. On leaving college he was placed in a provision house, of which he soon became head, when the revolution of 1789 began. Perceiving that the freedom of the press would cause a rise in paper he made contracts with the principal manufacturers for all their products for two years, which enabled him quickly to realize 300,000 francs on the enforced advance. Entering into larger speculations which were enormously profitable, in 1793 he was denounced by Carrier to the committee of public safety as a monopolizer, and would probably have felt the guillotine had he not entered the army in a manner that suspended arrest, and enabled him to return to Paris the bearer of flags taken from the enemy. While there he successfully interceded for 132 imprisoned citizens of Nantes, and after the fall of Robespierre made friends with the new government, secured immense contracts, and in 1797 made 15,000,000 francs out of one contract with the Spanish government. In 1798 he loaned 10,000,000 francs to the French directory, and submitted a plan for the reorganization of the treasury department. The directory accepted the money but not the plan. In 1799 Bonaparte desired to borrow 12,000,000 more, but Ouvrard objected, and the former found excuse to arrest and imprison him in 1800. Ouvrard did not cede the loan, and Bonaparte, after failing to find evidence of dishonest practices, was obliged to give him freedom, when his commercial speculations then assumed still larger proportions. In 1802 he loaned the state 20,000,000 francs, and when the camp at Boulogne for the English invasion was preparing, his advances rose to 68,000,000 francs. Bonaparte, pleased to think he had drawn so much out of him, instructed his finance minister to pay back nothing. But Ouvrard's resources were greater than imagined, and in 1804 he advanced 200,000,000 more, and agreed to provide the state with all the money needed for Bonaparte's gigantic operations. In 1806 Bonaparte again endeavored to embarrass him, on the supposition that he was exhausted, and by a decree made him responsible for a debt of Spain. In 1809 another decree ordered his arrest and the sequestration of his estates. This stretch of unbridled power was suspended over him rather than executed. About 1810 he was in communication with Fouché, when the fall of that police minister brought his re-arrest and incarceration in the Abbaye, the donjon of Vincennes, and Sainte-Pélagie where he remained until the fall of Napoleon in 1813. On the return of the Bourbons, Ouvrard again presented his plan of national finance to the chambers. It was not adopted. On the return of Napoleon from Elba, overlooking his brutal treatment, Ouvrard gave his aid in the form of a loan to pay the cost of the hundred days' campaign. Louis XVIII. refused to permit the acknowledgement of the debt; but it was already so distributed among third parties that a part only was finally repudiated. In 1817 Ouvrard's plan for the reorganization of the French treasury and its loan system was adopted, and proved a great and permanent advantage to France. In 1820 he addressed a memoir to the government demanding that cases pending between citizens and the state should be tried in ordinary courts like other cases, and not by special appointees of the crown. Accused in 1824 of dishonesty in connection with supplies for the French army in Spain, he was tried and fully acquitted; but was subsequently convicted of some improper procedure in the Bourse, and sentenced to a punishment, which was avoided by going to England, where he thenceforward lived an inconspicuous life.

OUZEL, or Ousel (Old Fr. *oisel,* bird), an old name of the blackbird, as is evident from the descriptive lines of Bottom's song in *Midsummer Night's Dream:*

> The ousel cock, so black of hue,
> With orange tawny bill.

It is also applied to other birds, chiefly of the thrush family. Thus, one British thrush is called the ring ouzel. The dipper (q.v.) is very generally known as the water ouzel: and the rose-colored pastor is also called the rose-colored ouzel.

OVAL, the name given to the figure presented by a longitudinal section of an egg through its center. The oval has a general resemblance to the ellipse; unlike the latter, however, it is not symmetrical, but is thicker at one end than the other, and at the thin end narrows almost to a point. The term "oval" is also used indiscriminately with "nodus," "loop," to denote the figure formed by a curve which either returns upon itself, as the lemniscata, etc., or the loops of the cubical and semi-cubical parabolas and other curves. In scientific language it is specially distinguished from the term "elliptical," with which, in common parlance, it is usually confounded.

OVAM'POS and **OVAMPOLAND.** The Ovampos or Otjiherero are a tribe, seemingly a connecting link between the Kaffir and Negro races, who inhabit the region n. of Great Namaqualand, in South Africa, extending n. to the Cuanene river, and s. to the parallel of 23° s. latitude. The Ovampo tribes are described by Andersson as of a very dark complexion, tall and robust, but remarkably ugly. He found them, however, honest, industrious, and hospitable. They are not entirely pastoral, but cultivate much corn. Living in the same country are the Cattle Damaras, with still more of the negro type, a stout, athletic people, very dirty in their habits, and generally armed with the

bow and arrow. They live in a state of constant warfare with the Ghondannup, or Hill Damaras, a nearly pure negro race, on the one hand, and the Namaqua Hottentots, who live s. of them, on the other.

Ovampoland is a more fertile region than Namaqualand, from which it is separated by a wide belt of densely-bushed country. It has but few rivers, and these not of a perennial nature. About 50 m. from the coast the country rises to a table-land about 6,000 ft. above the sea-level, and then declines to the s. and e. into the deserts of the Kalihari and the region of lake Ngami. Many strong indications of copper-ore are found in various places. The principal rivers, or rather water-courses, are the Swakop, Kusip, and their branches, which enter the Atlantic a few miles n. of Walfish bay. The other rivers in the interior seem to lose themselves in the sands. The climate is healthy except near the coast, where fever in some seasons prevails. It seldom rains in the coast region, which is a very desolate one, and almost devoid of water. Thunder storms are very violent in the summer season. All the large mammalia are found, more or less plentiful, according as water may be found at the different drinking-places. Elephants, rhinoceroses, elands, and other large animals driven from the s. by the march of civilization, take refuge in the desert region lying e. of Ovampoland, where sportsmen like Green and Andersson have been known to kill as many as 12 elephants in a day. The country was first described by sir J. Alexander, who visited its s. border. Mr. Galton afterward penetrated much further north; and Mr. C. J. Andersson has since fully explored it nearly as far n. as the Cuanene. Large numbers of horned cattle are annually collected by traders from the cape in these regions, and whales abound on the coast. The trade in ostrich feathers and ivory is of increasing importance, and several trading stations are established for the collection of native products. Some elementary works have been printed in the Otjiherero dialect by the German missionaries; two appear in sir G. Grey's catalogue.

O'VAR, a t. of Portugal, in the province of Beira, 20 m. s. from Oporto, at the mouth of the small river Ovar, and at the head of one of the branches of the curious lagoon or bay called Ria d'Aveiro. See AVEIRO. It is a prosperous and increasing town and carries on an extensive fishery and a considerable trade. Pop. 10,000.

O'VARIES are organs peculiar to the female, and are analogous to the testes in the male. They are two oblong flattened bodies (about an inch and a half in length, three-quarters of an inch in width, and nearly half an inch thick in the human subject), situated on either side of the uterus, to which they are connected by ligaments and by the Fallopian tube. On making sections of an ovary, numerous vesicles are seen. These are the ovisacs of the future ova or germs, and are termed the *Graafian vesicles*. Before impregnation they vary in number from 10 to 20, and from the size of a pin's head to that of a pea; but microscopic examination reveals the presence of young vesicles in large numbers. At each monthly period a ripe Graafian vesicle bursts, and the ovum contained in it makes its way by ciliary motion along the Fallopian tube to the uterus, where, if it is not impregnated, it is disintegrated and absorbed.

Solid tumors or cysts, containing hair and teeth, are developed in these organs, but their principal disease is that to which the name of *ovarian tumor* is applied. This tumor may be described as consisting of an enormous enlargement of one or more of the Graafian vesicles into a mass which may weigh 80 or 100 lbs., or even more; and it may be either simple (that is to say, composed of natural structures much hypertrophied) or cancerous. The walls of the cysts (or enlarged Graafian vesicles) may be thin and flexible, or thick and cartilaginous; and the fluid they contain may be clear and limpid, or thick and ropy, or grumous and opaque. The only disease with which it can be confounded is ordinary abdominal dropsy, or *ascites*, and when its nature is clearly determined, three modes of treatment are open for adoption: these are (1) tapping, (2) various surgical and medical means of producing atrophy of the tumor, and (3) extirpation of the organ, or ovariotomy.

1. Tapping is the simplest mode of relieving the patient; but the cyst soon refills, and the operation must be often repeated. "Cases are extant in one of which the patient lived to be tapped 66 times at intervals of about a month, and in another, 128 times at intervals of six weeks; but, taken as a general rule, it may be affirmed that few patients survive more than four years after the first tapping, a period passed in the greatest misery and suffering."—Druet's *Surgeon's Vade-Mecum*, p. 498.

2. Under this head are included both numerous operations for causing the tumor to waste, and its internal walls to adhere, and the internal administration of absorbent medicines, with the view of producing atrophy and absorption of the tumor. The injection of tincture of iodine into the previously emptied cyst, is sometimes followed with good results, as in the case of hydrocele (q.v).

3. Ovariotomy, or total extirpation of the morbid mass, is an operation regarding which there has of late years been much discussion. Its opponents urge (1) the difficulty of diagnosis; (2) the frequency of adhesion of the tumor to adjacent parts—a point which can often not be ascertained till the abdomen has been opened; and (3) the great mortality that follows it: while in favor of the operation it is urged (1) that the mortality is not greater than from some other surgical operations which are regarded as justifiable; (2) that no other plan of treatment can effect a radical cure; (3) that if the surgeon, in order

to complete his diagnosis, first makes a small incision to enable him to ascertain the existence of adhesions, and closes it again with suture, if he finds this to be the case, no great harm is likely to result; and (4) that considering the miserable lives these patients lead during a course of tapping, etc., it is the most merciful course to adopt in patients who are young and otherwise healthy. For a description of the mode of performing the operation, and of the cautions to be observed, we may refer to a series of papers on ovariotomy by Mr. Spencer Wells in *The Medical Times and Gazette* for 1858 and 1859.

OVARY, in botany. See GERMEN.

OVA'TION. See TRIUMPH.

OVEN, FIELD OR BARRACK, is a necessary apparatus in military economy to preserve the health of troops, by enabling them, at a comparatively small expenditure of fuel, to cook many rations together. In the British army little attention was paid to such subjects, until, in 1858, the inquiries of Mr. Sidney Herbert (afterwards lord Herbert) brought to light the excessive mortality among soldiers, which was partly—and, as the event has shown, justly—attributed to the bad cookery of their food. Capt. Grant has bestowed much attention to army cookery, and has invented ovens for barrack use and for the field. While great improvements on the system—or want of system—which preceded them, these ovens are still admitted to be far from perfect in their arrrangements. For boiling meat, etc., in the field, he employs detached cylinders, which, when empty, he proposes to join and floor over for use as pontoons; when in use they are united crosswise, one in the middle serving for a chimney. One or more empty barrels can be attached for steaming potatoes, and the roasting of coffee is performed, though not altogether successfully, in another cylinder made to revolve over the chimney. Up to the present time other systems have been partially resorted to; but none has as yet been definitively adopted to the exclusion of others.

OVEN-BIRD, *Furnarius,* a genus of birds of the family *Certhiadæ* (q.v.), natives of the southern parts of South America, interesting on account of the remarkable nests which they construct. They are small birds, with short wings and feeble power of flight. One species, *F. albogularis,* or *F. rufus,* is found near Buenos Ayres; another *F. fuliginosus,* inhabits the Malouine islands. It is a fearless little bird, regarding the presence of man so little that it may be easily struck down with a switch. Both sexes take part in the construction of the nest, which is generally in an exposed situation, remarkably large, and of the shape of a dome, with a small entrance on one side, so as to have much resemblance to a rude oven. It is made of clay, grass, etc., well plastered together, and becomes quite firm as the clay dries in the sun. Internally, it is divided into two chambers by a partition reaching nearly to the roof, the eggs being placed in the inner chamber on a bed of soft grass and feathers. The outer chamber seems to be intended for the male. The golden-crowned thrush of North America constructs a somewhat similar nest, but with one apartment, and is popularly called oven-bird.

OVER DAR'WEN or **DARWEN,** a t. of Lancashire, situated amid moorland hills, 3½ m. s. of Blackburn, and 18 m. n.w. of Manchester, with which towns it is connected by the Lancashire and Yorkshire railway. It has risen into wealth principally by a trade with India and China in calicoes. At present there are a large number of spindles and looms at work in it. The "India mill," erected some years ago, is in every respect one of the finest in the country. It is a first-class stone building in the Italian style, with engine-house, chimney, etc., highly ornamented, is 100 ft. high, and covers an area of 31,000 square feet. The town also contains the most extensive paper-staining works in England, paper manufactories, one calico printing establishment, as well as works for the manufacture of fire-bricks, tiles, and sanitary tubes, iron and brass founding, bleaching, machine and reed making. Coal-mines and stone-quarries also find employment for a considerable number of the inhabitants. The places of worship are—4 churches, 3 independent chapels; a Baptist, Wesleyan, Primitive, Methodist free church, and Roman Catholic chapel. There are large and commodious schools for elementary education. The town possesses a covered market, public baths, and a valuable free library. The central stores of the industrial co-operative society, erected in 1867, at a cost of £10,000, contain a public hall to accommodate 1500 people. This society, which soon had over 2,000 members, has several thriving branches. It maintains science classes, and possesses an extensive library, and well supplied news-rooms, free to members and their families. Pop. '51, 11,702; '61, 16,492; '81, 30,000; '91, 34,192.

OVERBECK, JOHANN FRIEDRICH, b. at Lübeck, Germany, July 4, 1789; a painter to whom is justly awarded a large share of the merit of the movement in the early part of this c. from which arose the modern German school of art. He commenced his studies as an artist at Vienna in 1806; but having adopted, and continued to persist in carrying out certain notions on art, and the mode of studying it, essentially different from those inculcated in the academy, he was expelled along with certain other students who entertained the same views, and in 1810 set out for Rome. Here he was soon afterward joined by Cornelius and Schadow; and these three, animated with similar ideas, and mutually

encouraging one another, laid the foundation of a school that now holds a high rank, and has in no small degree influenced the taste for art in Europe at the present time. A picture of the Madonna, which Overbeck painted at Rome in 1811, brought him into marked notice. He was next employed along with Cornelius and others, by the Prussian consul, Gen. Bartholdi, to execute certain frescoes illustrating the history of Joseph, the "Selling of Joseph" and the "Seven Lean Years" being the subjects assigned to him. After completing these, he painted in fresco, in the villa of the Marchese Massimi, five large compositions from Tasso's *Jerusalem Delivered*. In 1814, along with some of his artistic brethren, he abjured Lutheranism, and embraced the Roman Catholic religion. Overbeck's chief work is a fresco at Assisi, "The Miracle of Roses of St. Francis." His oil pictures are inferior to his frescoes, being dry and weak in color. His great picture, "The Influence of Religion on Art," preserved in the Stadel institute at Frankfurt, and well known from the engraving, is an admirable composition, and is indeed the most favorable specimen of his powers as a painter in oil colors. He executed a great many drawings remarkable for high feeling, most of which have been engraved. One of his last undertakings, a series of designs from the Evangelists, delicately engraved in the line manner, is a work of high excellence. Overbeck adhered closely to those ideas of art which he started with—namely, entire devotion to the style of the Italian artists prior to the period of the renaissance, particularly Fra Angelico (b. 1387—d. 1455), and a strong impression that form or drawing in the style of Greek or classic art is inadmissible in works embodying religious subjects; although many of his compatriots—Cornelius, for instance—have modified, or perhaps enlarged these ideas, and study the works of Michael Angelo and those of Raphael's later style executed under the influence of classic art. Overbeck resided in Rome from the time he went there as a student. He d. Nov., 1869. See illus., KAULBACH, ETC., vol. VIII.

OVERBURY, Sir THOMAS, an English author and courtier, whose mysterious death has given a peculiar interest to his history, was the son of Nicholas Overbury, a Gloucestershire squire, and was b. at Compton-Scorpion, Warwickshire, the residence of his maternal grandfather in 1581. At the age of 14 he entered Queen's college, Oxford, where he highly distinguished himself in logic and philosophy, and where he took the degree of B.A. in 1598. He then joined the middle temple, but soon after set out for the continent, from which he returned with the reputation of being a finished gentleman. While on a visit to Scotland in 1601, he met for the first time with his future murderer, Robert Carr (properly Ker), then a page in the service of the earl of Dunbar. An intimacy unfortunately sprung up between the two, and Carr—a handsome ignoramus, sensual and unprincipled—followed his scholarly friend to London. On the accession of James to the English throne (1603), Carr rose rapidly into royal favor, and was created viscount Rochester. Through his influence, Overbury was knighted in 1608, and his father appointed a judge for Wales. In return, Overbury gave his patron the benefit of his wit and judgment, both of which were singularly excellent; and, according to Hume, it was owing to Overbury that Carr enjoyed for a time the highest favor of the prince without being hated by the people. The circumstances that led to a rupture of their intimacy, and turned the earl into Overbury's secret and rentless enemy, form one of the most flagrant scandals in the history of the English court. A brief outline of these circumstances is all that can be given here.

At the age of 13, Frances Howard, daughter of the earl of Suffolk, was married (1606) to the earl of Essex, himself only a year older. On account of their youth, it was reckoned advisable by their friends that they should not live together for some time. The boy-husband went away on his travels, and the wedded girl to her mother. After the lapse of nearly 5 years, Essex came home, and found his wife, now a splendid beauty of 18, the idol of all the court gallants. But there was not a touch of virtue or goodness in her whole soul. She had the disposition of a Messalina (q.v.) or a Brinvilliers (q.v.). For her husband she showed the greatest aversion, and only consented to live in his house at the command of the king. It was well known that she had had intrigues with more than one lover, but in particular with Rochester, for whom she now cherished a fierce passion. Overbury had been instrumental in bringing about their guilty intercourse, and was now to reap the reward due to a pander. Rochester having told him that he purposed to get Lady Essex divorced from her husband, and then to marry her, Overbury strongly deprecated the idea, and declared that it would be disgraceful to form a union with so depraved a creature—she might do for a mistress, but not for a wife! The earl told Lady Essex what Overbury had said of her; she became furious for revenge, and offered sir David Wood (between whom and Overbury there was a standing quarrel) £1000 to assassinate him, which that canny Scot declined to do. Rochester himself was now persuaded by his mistress to join privately in a plot against Overbury, who on a most trivial and illegal pretext was thrown into the Tower, April 26, 1613. It was some time before he could bring himself to believe that his friend and patron was the cause of his imprisonment; but when he had assured himself of Rochester's treachery, he threatened to divulge certain secrets in his possession. whereupon it was determined by the earl and his mistress that he should be poisoned. This, after several trials, was successfully accomplished, and Overbury expired on Sept. 15th. Rochester (now created earl of Somerset), and his paramour were married on Dec. 26th with great pomp, the brazen-

faced beauty wearing her hair "as a virgin," and the whole affair was soon to appearance forgotten; but after George Villiers had supplanted the earl in the royal favor, an inquiry was instituted; Somerset and his wife were tried and found guilty of poisoning, but were, by an amazing and infamous stretch of the royal prerogative, pardoned. The motive for James's extraordinary clemency has never been ascertained; but the prevailing opinion is, that it was to prevent the disclosure of some discreditable, if not criminal, incidents in the private life of that monarch.

Overbury wrote several works, all of which were posthumously published. The principal are, *The Wife* (1614), a didactic poem; *Characters* (1614), the wit, ingenuity, precision, and force of which have long been admitted; *Crumms Fal'n from King James's Table* (1715). The latest edition of Overbury's works is that by E. F. Rimbault with life (1856).

OVERCOMERS, a sect of Christians which sprang up near Chicago, in 1881, basing its doctrines upon a new interpretation of certain passages in the New Testament, especially Rev. ii., 11, 17, 26, 27, which allude to "him that overcometh." Mr. M. H. G. Spofford, the founder, was formerly a ruling elder in the Pres. church, but his new views caused his dismissal for heresy, whereupon he joined, with other church-members who had embraced his teachings, in founding a new congregation. The fundamental doctrines of the O. are that only those who overcome—*i.e.*, wholly sanctified Christians—are immediately saved at death, while all others, including Christians partially renewed, must go through purifying purgatorial fires; but that future punishment is not eternal, and that the soul of even the worst sinner will eventually be restored through the atoning blood of Christ. There is a congregation at Lake View, Ill., and another at Valparaiso, Ind.

OVERLAND ROUTE to India, the route generally chosen by those to whom time is a more important consideration than expense. The management of the route is in the hands of the Peninsula and Oriental steam company, who present the traveller with a choice of lines of route to Alexandria. He may sail from London (formerly Southampton) *viâ* Gibraltar and Malta, reaching Alexandria in 13 days, a very convenient route for those who have much luggage, as no shifting is required till Alexandria is reached; or he may travel overland by railway and steamer to Marseilles or Trieste. The shortest route from London to the former is *viâ* Dover, Calais and Paris, Alexandria being reached in 11 days (including necessary stoppages); and to the latter *viâ* Dover, Calais, Paris, Turin, and Venice. The shortest route to India at present, after reaching Paris, is *viâ* Lyon, the Mount Cenis tunnel, Modena, to Brindisi; from that Adriatic port by steamer to Port Said, thence through the Suez canal and the Red Sea to Bombay, the time occupied being from 20 to 21 days. Passengers may still go from Alexandria by rail to Suez, where they again embark on the P. and O. steamers. The time occupied in travelling from Alexandria to Bombay is 13 days, to Madras, 19 days, and to Calcutta, 23 days. Thus a traveller can reach Calcutta from London in 34 days, and at a cost of £68. He may now further shorten his route by going from Bombay to Madras by rail (775 miles), and to Calcutta (1,401 miles). The long sea-route round by the Cape of Good Hope cannot be accomplished by steamer in less than 94 days.

OVERSEERS are officers appointed annually in all the parishes in England and Wales, whose primary duty it is to rate the inhabitants to the poor-rate, collect the same, and apply it towards giving relief to the poor. These officers occupy an important position in all English parishes. They were first ordered to be appointed in each parish by the statute of 43 Eliz. c. 2, the leading poor-law act, which directed four, three, or two substantial householders in the parish to be nominated yearly, and a later statute fixed the time of nomination to be March 25, or a fortnight thereafter. The courts have held that not more than four, nor less than two, can be appointed, the object being, probably, that so much responsibility should not be thrown on any one individual, Though it is usual for the vestry of the parish to nominate two persons to be overseers, still those who really appoint them are the justices of the peace, who are not bound to regard the wishes of the vestry in this respect. It is only householders in the parish who are qualified for the office, and though it is not necessary that they should actually reside in the parish, still they must occupy or rent a house there. Several classes of persons are exempt from serving the office, such as peers, members of parliament, clergymen, dissenting ministers, barristers, attorneys, doctors, officers of the army and navy, etc. But all who are not specially exempted by some statute are liable to serve the office, and even women may be appointed, though they scarcely ever are so in practice. The office is compulsory, and entirely gratuitous; and so necessary is it that some one shall fill the office, that it is an indictable misdemeanor to refuse, without cause, to serve when duly appointed. Though overseers are the proper managers of the poor for each parish, yet some parishes, especially in large overgrown towns, have been regulated by local acts, and guardians of the poor provided; and other parishes are under what is called a select vestry. In such cases the overseers, though still appointed, are only allowed to give relief to paupers in certain urgent and exceptional cases, the ordinary regulation of poor-law affairs being confided to the guardians or the select vestry. The primary duty of the overseers consists in making, collecting, and applying the poor-rate for the relief of the poor of the parish, but, as will be seen, advantage has been taken by the legislature of the existence of these officers always representing the parish, to throw upon

them various miscellaneous duties which are not directly connected with poor-law affairs.

1. Of the duties connected with the management of the poor: The overseers, along with the churchwardens, are to make a rate once or twice a year; i.e., a list of all the occupiers of lands and houses in the parish, specifying their names and the property occupied by each, and the ratable value and amount due by each. The next thing to be done is to go before two justices of the peace and get the rate allowed—i.e., signed by them—and then it is published on the church door on the following Sunday. The overseers must collect the rate also; but in all large parishes there is a collector of poor-rates who is specially appointed and paid for the purpose of collecting it. If a party refuses to pay the rate, the overseers must take proceedings before justices to compel payment, which is done by distraining the goods of the party, or, if there are no sufficient goods, by getting a warrant to imprison him. The party may, however, appeal against the rate to the court of quarter sessions. When the money is collected, the overseers have to apply it towards the relief of the poor, and many other purposes of a kindred nature. Relief must be given to all the poor in the parish who are in a destitute state; but it is the duty of the overseers, when the pauper has not a settlement in the parish, to obtain an order of removal, i.e.; to get an order of justices, under which the pauper is taken by force and sent to the parish where he has a settlement. See Removal of Paupers. Relief is given, in general, only in the workhouse, and according to certain rules and conditions. Where the parish is included in a poor-law union, as is now generally the case, then the duty of overseers in giving relief is entirely confined to certain urgent cases; for the guardians of the union administer the ordinary business of the workhouse, and of relief generally. Another duty incident to overseers of a parish in a union is the duty of making out valuation lists —i.e., a new valuation of the property in the parish—which list is ordered by the guardians with a view to produce some uniformity in assessing the burdens on the various occupiers. Formerly the mode of valuing property for the purposes of the poor-rate was not subject to any uniform rule, and in some parishes the valuers made a larger deduction from the actual value than in others; but in 1862 a statute passed, called the union assessment act, the object of which was to enable new valuations to be made on a uniform plan, till the occupiers in all the parishes are treated alike. At the end of the year of office, the accounts of the overseers of parishes in unions are audited by a poor-law auditor, who is a paid officer, and who examines the vouchers, and sees that no illegal payments have been made.

2. The miscellaneous duties now imposed by statute on overseers, over and above their original duty of relieving the poor, are numerous. The most prominent, perhaps, is that of making out the list of voters for members of parliament. This duty is done in obedience to certain precepts issued by the clerk of the peace each year, who gives the overseers full instructions how to make out the lists, and what claims and objections to receive, and how to deal with them. The overseers must also attend the court of the revising barrister, when he revises the lists, and disposes of legal objections. Another duty of the overseers is to make out the list of persons in the parish qualified to serve as jurors. So they must make out the burgess lists when the parish is situated within a borough. They must also make out the list of persons qualified to serve as parish constables. They are also bound to appoint persons to enforce the vaccination acts; they must give notice to justices of all lunatics within the parish, and pauper lunatics are removed to the county asylum. They must also collect and enforce payments of the rates levied to pay the expenses of school-boards. The overseers must also perform certain duties as to the election of guardians for the union. They must also bury the dead bodies of persons cast on shore, and of all paupers who die in the parish. They also are the proper parties to protect village greens from nuisances; and in general, where there is no local board of health, the overseers are the parties bound to act in carrying out the nuisances removal acts (see Nuisance) within the parish, which of itself is an onerous duty. In general, whenever overseers are bound to do miscellaneous duties of this kind, they are authorized to pay the necessary expenses and disbursements out of the poor-rate; but, as already stated, their services are gratuitous. The duties which in England are performed by overseers, devolve, in Scotland, upon the parochial board, the sheriff-clerk of the county, session-clerk, and others.

OVERSTONE, Samuel John Lloyd, **Lord**, one of the most skillful political economists, and the ablest writer on banking and financial subjects that England ever has produced. He was born in 1796, being the only son of Mr. Lewis Lloyd, descended from a respectable Welsh family, and a leading partner in the eminent banking house of Jones, Lloyd and Co., of London and Manchester. Having gone through a regular course of instruction at Eton, young Lloyd was sent to Trinity college, Cambridge, where he had Dr. Blomfield, late bishop of London, for tutor, and where he acquired a very extensive acquaintance with classical literature, and with the history and literature of his own country and of Europe generally. On leaving Cambridge, Lloyd entered the banking-house as a partner along with his father, and on the retirement of the latter he became its head. He distinguished himself highly in his capacity of banker. He had a profound knowledge of the principles of banking, and these he applied on all occasions in

conducting the business in which he was engaged. Far-sighted and sagacious, he was seldom deceived by appearances or pretensions, however specious. Perhaps, if anything, he was too cautious; but he was neither timid nor irresolute. He was eminently successful in the employment of the very large deposits at his command, and while he eschewed hazardous transactions, he did not shrink from engaging in very extensive operations when he believed they could be undertaken with a due regard to that safety which should always be the first consideration in the estimation of a banker.

Lloyd entered parliament in 1819 as member for Hythe, which he continued to represent till 1826. He made several good speeches in the house; and was one of a small minority that voted for the proposal to make bankers issuing notes give security for their payment. Though opposed to all changes of a dangerous or revolutionary character, Lloyd had been always a consistent liberal. Having either withdrawn, or being on the eve of withdrawing, from business, Lloyd was raised to the peerage in 1850, by the title of baron Overstone and Fotheringhay, county Northampton; and if great wealth, consummate intelligence in regard to matters of great public importance, and the highest degree of integrity and independence, be qualified for a seat in the lords, few peers had had a better title to be enrolled in that august assembly.

The first of lord Overstone's famous tracts on the management of the bank of England and the state of the currency was published in 1837, and was followed by others between that period and 1857. The proposal for making a complete separation between the banking and issue departments of the bank of England, introduced by sir Robert Peel into the act of 1844, was first brought forward in these tracts, and its adoption has been the greatest improvement hitherto effected in our banking system. Having been collected, these tracts were published in 1857, with extracts from evidence given by lord Overstone before committees of the lords and commons. And it would not be easy to exaggerate the value of this volume. Lord Overstone has also reprinted, at his own expense, four volumes of scarce and valuable tracts on metallic and paper money, commerce, the funding system, etc., which were extensively distributed.

An inquiry took place before a committee of the house of commons in 1857 into the practical working of the act of 1844, and lord Overstone was the principal witness who came forward in defense of the act; but several leading members of the committee being hostile to it, exerted themselves to overthrow his lordship's theories and opinions, and subjected him to a severe cross-examination; which gave lord Overstone the opportunity of successfully vindicating the principles and practical working of the act. This evidence was published in a separate volume in 1857.

Lord Overstone did not often speak in the house of lords. His speech on the commercial treaty with France is probably the best of his parliamentary appearances. He was invariably a zealous opponent of the principle of limited liability. He was a leading member of the commission appointed to inquire into the proposal for the introduction of a decimal system of arithmetic, and powerfully advocated the opinion that it would be injurious rather than beneficial.

All who had the privilege of knowing lord Overstone regard him as one of the most honorable, high-minded, and upright man in the empire. But his rigid adherence to principle in his writings, his dealings, and his conversation, and his undisguised contempt for twaddle and pretensions of all sorts, have made him be generally looked upon as austere and without sympathy. Such, however, was not the fact. When proper cases for the display of sympathetic and generous feelings were brought before him none evinced them more strongly. We may add that his conversational talents were of the highest order. He d. 1883.

OVERTON, a co. in n. central Tennessee, bordering on Kentucky ; drained by Ovie's river and the West fork ; 360 sq.m.; pop. '90, 12,039, chiefly of American birth, with colored. The surface is broken, but the soil fertile. The chief products are maize, wheat, oats, cattle, and pork. There are extensive forests of ash oak, hickory, tulip, and maple. Coal is found. Co. seat, Livinsgton.

O'VERTURE (from Fr. *ouverture,* opening), a musical composition for a full instrumental band, introductory to an opera, oratorio, cantata, or ballet. It originated in France, and received its settled form at the hands of Lulli. Being of the nature of a prologue, it ought to be in keeping with the piece which it ushers in, so as to prepare the audience for the sort of emotions which the author wishes to excite. Such is to a great extent the character of the beautiful overtures by Mozart to *Zauberflöte* and *Don Giovanni,* by Weber to *Freischütz,* and by Mendelssohn to his *Midsummer Night's Dream,* which are enriched by snatches of the more prominent airs in these operas. In the end of last century overtures were written by Haydn, Pleyel, and other composers, as independent pieces to be played in the concert room; this sort of overture being, in fact, the early form of what was afterwards developed into the symphony (q.v.). The overture, as well as the symphony, is designated by the name *sinfonia* in Italian.

OVERWEG, Adolf, 1822–52 ; b. Hamburg. He studied geology at the universities of Bonn and Berlin, and in 1850 joined Barth and Richardson in their explorations of central Africa. He reached Lake Tchad with a boat which had been brought overland from Tripoli; and devoted five weeks to exploring that lake, being the first European who had ever sailed upon its waters. He then tried to penetrate the Fellatah kingdom

of Yakoba, n.w. of the Benoowe, but his health was shattered and he returned to Kuka, near which place he died Sept. 27, 1852. He made a number of discoveries, among which was the fact that the desert of Sahara is an elevated plateau, and not a depressed plain. His reports appeared in Vol. VIII. and IX. of *Monatsberichte der Gesellschaft für Erdkunde;* and Vol. I. of Petermann's *Zeitschrift für Allgemeine Erdkunde.*

OVERYS'SEL, a province of the Netherlands, is bounded on the n. by Friesland and Drenthe; e. by Hanover and Westphalia; s. and s.w. by Gelderland; and w. by the Zuyder Zee It has an area of 1,292 sq.m.; and (1895) a pop. of 314,805. The soil is sandy, with clay lands by the Yssel, rich pastures along the Zuyder Zee and rivers, tracts of peat-land in various parts, and extensive heaths which are gradually being brought into cultivation. From south to north the province is intersected by an unbroken chain of sand-hills. The chief cities are Zwolle, Deventer, and Kampen; important manufacturing towns of less note being Almelo, Avereest, Dalfsen, Haaksbergen, Hardenberg, Hellendorn, Lonneker, Losser, Raalte, Staphorst, Steenwykerswold, Tubbergen, Weerselo, Wierden, Zwollerkerspel, etc. The principal employments are: agriculture, manufactures of various kinds, fishing, making peat, shipping, and merchandise. There are very many cotton mills and bleaching establishments in the district of Twenthe: Yssel has brick and tile manufactures; while mats and besoms are made by the people of the coast. There is extensive cattle-raising; and potatoes, buckwheat, oats, barley, wheat, rye, beans, flax, etc., are grown in abundance.

At Zwolle, Deventer, Kampen, Almelo, and Steenwyk, besides the ground produce, are the great butter manufactories. In Overyssel thousands of acres are still waste.

Carpets are manufactured at Deventer and Kampen, leather at Blokzyl, calicoes and other cotton fabrics at Kampen, Almelo, Dalfsen, Ommen, and many other towns. There are extensive brick-works at Ryssen, Zwollerkerspel, Markelo, and Diepenveen. Shipbuilding is carried on at Zwartsluis, Vollenhove, Steenwykerswold, Avereest, etc. There were in 1875, 181,863 Protestants, and 76,891 Roman Catholics, and a few churches belonging to smaller Protestant sects. There were at the same time 4,018 Jews. 14 communes (including Wolle, the chief city) numbered in 1890 more than 2500 inhabitants. Commerce has been increased by the opening of several large canals.

The principal rivers are the Yssel, into which the Schipbeek runs, and the Overysselsche Vecht, which falls into the Black Water. Other important water-ways are the Dedems-Vaart and the Willems-Vaart canals. There are more than 100 m. of railways in the province. The island of Schokland, in the Zuyder Zee, belongs to Overyssel.

OVIBOS. See Musk-Ox.

O'VID (Publius Ovidius Naso), the descendant of an old equestrian family, was b. on Mar. 20, 43 B.C., at Sulmo, in the country of the Pæligni. He was educated for the bar, and under his masters, Arellius Fuscus and Porcius Latro, he became highly proficient in the art of declamation. His genius, however, was essentially that of the poet, and the writing of verses began to absorb the time that should have been spent in the study of jurisprudence. His father, having but a scanty patrimony to divide between two sons, discouraged this tendency in the younger, but in vain. By the death of his elder brother, Ovid inherited all his father's property, and went, for the completion of his education, to Athens, where he acquired a perfect mastery of the Greek language. He afterwards made a tour in Asia and Sicily along with the poet Macer. It is uncertain whether, on his return to Rome, he ever practiced as advocate. Although by birth entitled to aspire to the dignity, he never entered the senate; his weakness of body and indolence of habit prevented him from ever rising higher than from the position of triumvir capitalis to that of a decemvir, who convened and presided over the court of the centumviri. While his public life was unimportant, his private was that of a gay and licentious man of letters. The restraint of the matrimonial tie was always distasteful to him; twice married in early life, he soon divorced each of his wives; while he carried on an intrigue with a lady whom he celebrated as Corinna, and who is believed to have been no other than Julia, the accomplished daughter of Augustus. Before his thirtieth year, he married a third time, and became the father of Perilla, of whom he was tenderly fond. Up till his fiftieth year, he resided chiefly at Rome, in a house near the capitol, and occasionally visited his Pelignan estate. His society was much courted, and his large circle of distinguished friends included Augustus and the imperial family. By an edict of the emperor, however, he was, in 8 A.D., commanded to leave Rome for Tomi, a town near the delta of the Danube, and on the very limit of the empire. The sentence did not condemn him to an *exsilium,* but to a *relegatio*—or, in other words, he did not lose his citizenship, nor was he cut off from all hope of return. The cause of this sudden banishment has long divided the opinion of scholars, since the one mentioned in the edict—the publication of his *Ars Amatoria*—was a mere pretext, the poem having been in circulation for ten years before. His intrigue with Julia, or with Julia's daughter, and the consequent displeasure of Augustus or of Livia, have been adduced with various degrees of plausibility, as the cause of a sentence to which Ovid himself only mysteriously refers. The misery of his life on the inhospitable and barbarous shore of the Euxine is commemorated by the poems in the composition of which he found his solace. He became

a favorite with the Tomitæ, whose language he learned, and before whom he publicly recited some poems in honor of Augustus. But his devotion to the emperor, and the entreaties addressed to the imperial court by himself and his friends, failed to shorten the term, or to change the scene of his banishment; so he died, an honored citizen of Tomi, 18 A.D., in his sixtieth year. His works which have come down to us, either in whole or in part, appeared in the following order: 1. *Amorum Libri III.*, a revised and abridged edition of an early series. 2. Twenty-one *Epistolæ Heroidum.* 3. The *Ars Amatoria.* 4. *Remedia Amoris.* 5. *Nux*, the remonstrance of a nut-tree against the ill-treatment it receives from the wayfarer, and even from its owner. 6. *Metamorphoseon Libri XV.* This is deservedly Ovid's best-known work. It seems to have been written between the poet's fortieth and fiftieth years, and consists of all the transformations recorded in legend from the creation down to the time of Julius Cæsar, whose change into a star forms the last of the series. 7. *Fastorum Libri XII.*, the first six of which are all that remain. The poem is a Roman calendar versified, and describes the appropriate festivals and mythic legends from materials supplied by the old annalists. 8. *Tristium Libri V.*, written in elegiac meter, during the first four years of the poet's banishment. They are mainly descriptive of his miserable fate, and are full of appeals to the clemency of Augustus. 9. *Epistolarum ex Ponto Libri IV.*, also written in elegiac meter, and similar in substance to the *Tristia.* 10. *Ibis*, a short satire against some traducer of the poet's. 11. *Consolatio ad Liviam Augustam*, held spurious by some critics. 12. *Medicamina Faciei* and *Halieuticon*, dubiously genuine, and of which we possess but fragments. Several of his works are entirely lost, the one best known to antiquity being *Medea*, a tragedy.

The poetical genius of Ovid has always been admired. A masterly facility of composition, a fancy vigorous and rarely at fault, a fine eye for color, and a versification very musical in its flow, are the merits which have made him a favorite of poets from Milton downwards, in spite of his occasional slovenliness and falsity of thought. The best editions of Ovid's entire works are Burmann's (Amsterdam, 1727), and the later one of Merkel; while excellent commentaries on one or other of his poems have been published by Haupt, Ramsay, and Paley. A good translation of his *Metamorphoses* is that edited by Garth, with the assistance of Dryden, Addison, Congreve, and others; while special passages of the same poem have been admirably rendered by Mr. D'Arcy Thompson.

OVIE'DO, a pleasant and healthy city of Spain, capital of the modern province of the same name (the ancient Asturias, q.v.), stands on a plain between the rivers Nalon and Nora, 61 m. n.n.w. of Leon, and 72 m. n. by w. of Leon, on the bay of Biscay. In the center of the city is a handsome square, from which four principal streets terminating in alamedas or promenades, branch off toward the n., s., e., and w., respectively. These main streets are connected by others, and all are clean and well-paved. Pure water is abundantly supplied by means of a long aqueduct, and is delivered in the city by eleven public fountains. The cathedral, a beautiful cruciform specimen of Gothic, the ornamentation of which is as rich as it is elegant, contains (in the chapel of the Virgin) the remains of many of the early kings and princes of Asturias, and has a fine old library. Some curious, but eminently questionable relics, are to be found in the church of *San Miguel*, which is the second oldest Christian building after the Moorish invasion. In the immediate vicinity of the city there are other churches in the early Saxon style, which are among the oldest churches in the peninsula. The convent of San Vincente, founded in 1281, has been secularized, and is now occupied by government offices, etc. Linens, woolens, hats, and fire-arms are manufactured. Pop. 42,716.

Oviedo was known during the middle ages as *Civitas Episcoporum*, because many of the Spanish prelates who had been dispossessed of their sees by the Moors, took refuge here. This city, which is the see of a bishop, was twice plundered of its ecclesiastical and other treasures during the war of independence; first by Soult, and subsequently by Bonnet.

OVIEDO Y VALDÉS, Gonzalo Fernandez de, a Spanish chronicler, b. at Madrid in 1478, was sent by Ferdinand to St. Domingo, in the West Indies, in 1514, as intendant and inspector-general of the trade of the new world. During his long residence in St. Domingo, he spent his leisure in acquiring an extensive knowledge of the West Indies; and after his return to Spain published at Toledo, in 1526, a *Summario de la Historia General y Natural de las Indias Occidentales*, which he dedicated to Charles V. He afterwards made some additions to the work, which was republished at Seville in 1535, in 21 vols., under the title of *La Historia General y Natural de las Indias Occidentales.* He left other 29 books in manuscript. A complete edition is now being prepared at Madrid. Oviedo died at Valladolid in 1557. Besides his *History of the West Indies*, he wrote *Las Quinquagenas*, a valuable, gossiping, and anecdotical account of all the principal personages of Spain in his time, which still remains in MS. in the royal library at Madrid; and chronicles of Ferdinand, Isabella, and Charles V. A life of cardinal Ximenes is also attributed to him.

OVIP'AROUS, a term applied to animals in which reproduction takes place by eggs (*ova*). Except the mammalia, all animals are either oviparous or ovoviviparous (q.v.); the latter mode—which is not essentially different from the former—being comparatively

rare. Even those invertebrate animals which multiply by gemmation and division have also a true reproduction by *ova.* See EGG and REPRODUCTION.

O'VOLO, a convex moulding much used in classic architecture. See MOULDINGS. In Roman architecture, the ovolo is an exact quarter of a circle; in Greek architecture, the curve is sharper at the top and quirked. It is sometimes used in *decorated* Gothic.

OVOVIVIP'AROUS, a term applied to animals of which the egg is hatched within the body of the mother, so that the young is excluded alive, although the fetus has been inclosed in an egg almost to the time of parturition. It is probable that the egg is often broken in parturition itself. Some fishes are ovoviviparous, and some reptiles; also the *monotremata.* The common lizard and the viviparous lizard, both natives of Britain, are illustrations of the near resemblance which may subsist between oviparous and ovoviviparous animals. The distinction is much less important than might be supposed.

O'VULE (Lat. a little egg), in botany, the rudimentary seed. The germen (q.v.) or ovary sometimes contains only one ovule, sometimes a small *definite* number, sometimes a large *indefinite* number. Ovules are to be regarded as metamorphosed buds. "The single ovule contained in the ovaries of compositæ and grasses may be called a terminal bud, surrounded by a whorl of adhering leaves or carpels, in the axil of one of which it is produced."—Balfour, *Manual of Botany.* The ovule is not always contained in an ovary. In gymnogens (q.v.) it is wanting, and the ovule is *naked;* but the plants possessing this character are comparatively few. The ovule is attached to the *placenta* (q.v.), and by it to the carpel (q.v.), from which it is developed. The attachment to the placenta is either immediate, when the ovule is said to be *sessile,* or by means of an umbilical cord (*funiculus*), which sometimes elongates very much after fecundation. The ovule is, in general, essentially formed of a cellular *nucleus* inclosed by two membranes, the outer of which is called the *primine,* and the inner the *secundine.* At one end of the nucleus there is an opening of both membranes—the *foramen*—through which the access of the pollen in fecundation (q.v.) takes place. The *chalaza* (q.v.) unites the nucleus and these membranes at the base. When the ovule is so developed that the chalaza is at the base, and the foramen at the apex, it is said to be *orthotropal* (Gr. *orthos,* straight, *tropos,* a mode). When the ovule is bent, so that the foramen is brought near to the base, it is called *campylotropal* (Gr, *kampylos,* curved). When by increasing on one side more rapidly than on the other, the ovule has its foramen close to the base, the chalaza being carried round to the opposite extremity, the ovule is *anatropal* (Gr. *anatrepo,* to turn upside down). Anatropal ovules are very common. When the ovule is attached to the placenta, so that the foramen and chalaza are at opposite ends, the base being in the middle, it is called *amphitropal* (Gr. *amphi,* around).—When the ovule arises from the base of the germen, it is said to be *erect;* when it hangs from the apex of the cavity of the germen, it is *pendulous;* when it arises from the side of the germen above the base, it is *ascending;* when it hangs from the side of the germen below the apex, it is *suspended.* When two or more ovules are found, not only in the same ovary, but in the same cell, they generally exhibit different modes of attachment. See CHALAZA, EMBRYO, FECUNDATION, GERMEN, PLACENTA, SEED.

OWARI, a province in central Japan, bordering on a bay of the same name, into which the Kiso river, noted for its lumber booms, empties. The chief city is Nagoya. Owari contains the oldest potteries in Japan, and the famous Owari blue and painted ware is exported in large quantities. The "seto" ware or common blue-and-white crockery of Japan was first made at Seto village in Owari in 1237, by Kato Shirozayemon, who learned the art in China. Owari-ware in its decoration follows closely that of Kioto faience. Owari is the seat of much literary activity, and was long noted for its collections of books on natural history.

OWASCO LAKE, in s.e. central Cayuga co., N. Y., 11 m. long, and from ½m. to 1½m. in width ; 758 ft. above the sea level. It lies in the midst of picturesque scenery and the neighborhood is a favorite summer resort. Its waters are discharged by an outlet leading into Seneca river.

OWEGO, village and co. seat of Tioga co., N. Y.; at the junction of the Susquehanna river and Owego creek, and on the New York, Lake Erie, and Western, the Delaware, Lackawanna, and Western, and the Lehigh Valley railroads; 22 miles w. of Binghamton. It contains the Coburn public library, an academy, co. court-house, electric light plant, several national banks, waterworks on the gravity and pump system, daily and weekly newspapers, and manufactories of wagons, harness, butter, flour, woolen goods, and machinery. The village has a large lumber and agricultural trade. It has become a popular summer resort, and among its attractions are the homes of the late Nathaniel P. Willis and of Thomas C. Platt, Benjamin F. Tracy, Gen. I. S. Catlin, and the Rockefeller brothers. Pop. '90, town, 9008; village not separately reported.

OWEN, a co. in w. central Indiana; drained by White river, Mill creek, and Eel river, and intersected by the Pennsylvania Co.'s railroad; 390 sq. m.; pop. '90, 15,040, chiefly of American birth. The surface is rolling, and there are extensive forests

Indian corn, wheat, oats, pork, and maple sugar are the chief products. Block coal, a variety of bituminous coal, abounds. Co. seat, Spencer.

OWEN, a co. in n.w. Kentucky, drained by the Kentucky river, which forms the n. boundary, and by Eagle creek; 312 sq.m.; pop. '90, 17,676, chiefly of American birth, 1501 colored. The soil is rich and produces tobacco, Indian corn, wheat, and oats. Of tobacco nearly 1,000,000 lbs. are raised annually. Co. seat, Owenton.

OWEN, David Dale, 1807–60; b. in Scotland, and the second son of Robert Owen; educated at North Lanark and in Switzerland. He came to this country in 1823, took a degree from the Ohio medical college and for some years studied his profession and scientific branches in Europe. In 1833 he returned to the United States, and was soon appointed state geologist of Indiana. Under the direction of the legislature he made a geological survey of the state, and in 1839 was employed by the U. S. government to make a survey of the mineral lands of Iowa, and in 1848 made similar surveys in Minnesota and adjoining territories. The results of his work were published by order of congress at an expense of $40,000 in an elegant quarto volume with many illustrations. He was employed in surveys of the same nature in Kentucky, 1852–57, and in 1857 was appointed state geologist of Arkansas. Reports of the results of his work in both states were printed.

OWEN, Dr. John, an eminent nonconformist divine, descended from an ancient Welsh family, was the son of the Rev. Henry Owen, vicar of Stadham, in Oxfordshire, and was born at the vicarage in 1616. In his 12th year he was entered of Queens' college, Oxford, where he worked with amazing diligence; for years taking no more than four hours sleep a night. In 1635 he "commenced" m.a. At this period (if his own statement does not exaggerate) his great ambition was to acquire celebrity either in church or state, he didn't particularly care which; and he affirms the irreligiousness and worldliness of his motives with entire frankness. Yet he appears, for all that, to have been agitated, even during his student-life, by the *quæstiones vexatæ* of ecclesiastical politics, and made himself so conspicuous by his anti-Laudianism that he was forced to leave Oxford. In fact, his Puritanism had become so decided that most of his former friends had abandoned his society. The next five or six years of his life were spent, speaking generally, in a state of anxious and melancholy introspection. When the civil war finally broke out, Owen was living as chaplain with lord Lovelace of Hurley, in Berkshire. His lordship was a royalist, and went to join the king's army, whither Owen, who had warmly espoused the cause of the parliament, could not accompany him. About the same time his uncle, a gentleman of property in Wales, who, having no children of his own, meant to have made Owen his heir, indignant at the zealous Puritanism of his nephew, settled his estate upon another, and died without leaving him a farthing. The almost friendless scholar now removed to London, where a casual sermon, preached by a stranger in Calamy's church, had the effect of imparting to his soul the peace he so ardently desired. In 1642 he published his *Display of Arminianism*, a work that proved very acceptable to the Puritan party, and drew upon him the favorable regards of the house of commons. Soon after, the "committee for purging the church of scandalous ministers" presented him with the living of Fordham, in Essex. His ministrations were exceedingly popular, people coming from great distances to hear him preach. While residing at Fordham he married a lady named Rooke, by whom he had several children. Not long after he removed to Coggeshall, where his views of church government underwent a modification. Up to this point he had been a Presbyterian, but he now became a moderate Independent or Congregationalist. It is almost superfluous to add that the Presbyterian ministers—intolerant, dogmatical, and acrimonious to a degree that is scarcely credible—fell upon him at once for his apostacy, but failed to perturb his sober temper. At Coggeshall he wrote his *Salus Electorum, Sanguis Jesu* ("The Blood of Jesus, the Salvation of the Elect"), a work the result of seven years study, and of which he himself said that "he did not believe he should live to see a solid answer given to it." His fame still increasing, he was sent for in 1646 to preach before the parliament. To his discourse, entitled *A Vision of Free Mercy*, he added an appendix, in which he pleads for liberty of conscience in matters of religion. He was again chosen to preach before the house of commons the day after the execution of king Charles I. (Jan. 31, 1649), but discreetly avoided a vindication of the act. About this time Cromwell made his acquaintance, and thought so highly both of his preaching and character that he insisted on Owen accompanying him to Ireland, where the latter remained about half a year. In 1650 he went with Cromwell to Scotland, and resided in Edinburgh for several months; in 1651 the house of commons appointed him dean of Christ church, Oxford; and in 1652, when only in his 36th year, he was admitted vice-chancellor of the university. The manner in which he discharged his duties reflects the highest credit on the impartiality of his disposition. Though himself an Independent, and owing his honors directly to the Independent party, Owen never showed himself a partisan. Most of the vacant livings in his patronage were bestowed on Presbyterians; and Episcopalians were allowed to celebrate divine worship in their own way, nor could the vice-chancellor ever be induced to offer them the slightest molestation. While at Oxford, the "Atlas of Independency," as Wood grandiloquently dubs Owen, wrote his *Diatriba de Divina Justitia*, his *Doctrine of the Saints' Perseverance*, his *Vindiciæ Evangelicæ*—against Biddle (q.v.)

and the Socinians—and his *Mortification of Sin in Believers.* He was one of the well-known "tryers" appointed to "purge" the church of "scandalous" (i.e., royalist) "ministers," and in this capacity signalized himself by his friendly offices on behalf of men of learning and merit, among whom may be mentioned the celebrated Dr. Edward Pococke, professor of Arabic. A coldness now appears to have sprung up between him and Crom well. Owen is said to have been opposed to what many people call the "ambitious" designs of the protector, and in 1657 he was succeeded as vice-chancellor of the university by Dr. Conant. The year after Cromwell's death he was ejected from his deanery, and retired to Stadham, in Oxfordshire, where he had purchased an estate, and where he formed a congregation, to which he ministered until his removal to London shortly after the restoration. The writings belonging to this period of retirement, if we may so call it, are, *Communion with God; On the Divine Original, Authority, Self-Evidencing Light and Power of the Scriptures; Theologoumena, or De Natura, Ortu, Progressu, et Studio veræ Theologiæ ;* and an uncritical irreflective, and unscholarly diatribe against Walton's *Polyglott,* in which the different readings of Scripture were learnedly set forth. In 1662 he published *Animadversions to Fiat Lux,* a treatise written by a Franciscan friar in the interest of Roman Catholicism. It was followed by works on *Indwelling Sin,* on the 130th Psalm, and on "The Epistle to the Hebrews," the last of which began to appear in 1668, and is usually reckoned Owen's *Magnum Opus.* In 1669 he published *Truth and Innocence Vindicated,* a reply to Samuel (afterwards bishop) Parker's *Discourse on Ecclesiastical Policy,* and in 1673 became pastor of a large congregation in Leadenhall street. His last publications of importance were a *Discourse Concerning the Holy Spirit* (1674); *Doctrine of Justification by Faith* (1677), a treatise still much admired by many; and *Christologia, or Glorious Mystery of the Person of Christ.*

Owen in his later years was held in the highest esteem by many of the most influential personages in the land, such as the earl of Orrery, the earl of Anglesea, lord Willoughby, lord Berkley, sir John Trevor. When drinking the waters at Tunbridge, even the duke of York and Charles II. paid him particular attention, and had long conversations with him on the subject of nonconformity. Owen died at Ealing, Aug. 24, 1683, and was buried in Bunhill Fields. His funeral was attended by no less than sixty noblemen. Owen was the most voluminous, but by no means the most powerful writer among the Puritan divines. His prolix and passionless disquisitions, his dull, tedious, and exhausting argumentations, his lack of subtile spiritual perception, his ponderous and lumbering style, make his writings the reverse of interesting; and one can almost pardon the irreverent criticism of Robert Hall, who is said to have pronounced them "a continent of mud." Yet Owen deserves respect for his learning and moderation. The best edition of his works was published at Edinburgh (1856, *et seq.*).

OWEN, John Jason, D.D., LL.D.; 1803–69; b. Conn. In his youth amid unfavorable circumstances he devoted himself with great earnestness to study with the special design to acquire the ancient languages. Without aid, he overcame the greatest difficulties by indomitable perseverance. After a course of study with the Rev. Dr. Yale of Kingsborough, N. Y., he entered Middlebury college (Vt.), graduating in 1829, and at the Andover theological seminary in 1831. The same year he was ordained a minister of the Presbyterian church. Though not a settled pastor, he preached often in the churches of New York. Under his instruction, private and public, many young men were fitted for the ministry of different denominations. In 1836 he was appointed principal of the Cornelius institute in New York. While there he edited Xenophon's *Anabasis* with English notes, the first Greek text-book thus prepared in the United States. This was followed by a *Greek Reader,* Xenophon's *Cyropædia,* the *Odyssey* and *Iliad* of Homer, and *Thucydides.* These books were well received. He then published the *Acts of the Apostles* with a lexicon, and finally *A Commentary, Critical, Expository and Practical, on the Gospels of Matthew, Mark, and the Acts,* 3 vols., as excellent a work for popular use as this country has produced. In 1848 Dr. Owen became professor of the Latin and Greek languages and literature in the New York Free Academy, of which in 1853 he became vice-principal. In 1866, when the name of the institution was changed to that of College of the City of New York, he became vice-president. Dr. Owen's eminence as a scholar was recognized by the learned men of England, Scotland, and America. He was an earnest preacher, a faithful instructor, and a genial friend.

OWEN, Sir Richard, was b. at Lancaster, July 20, 1804. Having received his elementary education at the grammar-school of that town, he became, at the age of 20, a student in the Edinburgh university. Under the guidance of the third Monro, Alison, Jameson, and Hope in the university, and of Barclay in the outdoor school, his natural talents early developed themselves. He was an active student, and, with others of kindred spirit, formed the Hunterian society, of which he was chosen president in 1825. In 1826 he removed to London, joining the medical school of St. Bartholomew's hospital; and to the medical society of this institution he communicated his earliest published paper: "An Account of the Dissection of the Parts concerned in the Aneurism, for the Cure of which Dr. Stevens tied the Internal Iliac Artery," which appeared in the *Medico-Chirurgical Transactions* for 1830. It was doubted whether so deep-seated an artery could have been reached, but he showed that the ligature had been applied to the internal iliac, and the aneurism had in this way been obliterated.

It had been his intention to enter the navy; but when he finished his education, he accepted an appointment as assistant to Mr. Clift, the curator of the museum of the Royal College of Surgeons, and helped him in the preparation of his catalogues of "Pathological Specimens" (1830), "Monsters and Malformations" (1831), but chiefly of the "Specimens of Natural History in Spirits" (1830). He had, about this time, the fortune to obtain a specimen of *nautilus pompilius*, an animal almost unknown, and of great importance not only in itself, but also and chiefly because of its numerous fossil allies. The results of his careful dissection of this specimen were published in an elaborate memoir, which at once gave him a high position amongst naturalists, for the advanced views on structure and affinities it contained.

The continued examination of Hunter's extensive collections in the College of Surgeons' museum was his great work. This resulted in the enlargement and arrangement of the collections, and in the publication of his *Descriptive and Illustrated Catalogue of the Physiological Series of Comparative Anatomy*, which was issued in sections during 1833–40; of his *Paleontological Catalogue*, of which the Mammals and Birds were published in 1845, and the Reptiles and Fishes in 1854; and of his *Catalogue of Recent Osteology* (1854), in which he describes 5906 specimens. The collections, which in 1828 were contained in one small badly-lighted room, in 1856, when Owen's connection with them terminated, filled 10 times the original space—three large galleries having been specially erected to contain them.

Owen's position as curator of the Hunterian museum, to which he succeeded on the death of Clift, awakened in him a special interest in its famous founder. In 1837, he published a new edition of Hunter's *Animal Economy*, adding to it all the known published papers of its author; and giving in the preface, for the first time, a descriptive narrative of Hunter's real discoveries. He afterward edited two volumes of *Essays and Observations on Natural History, Anatomy, etc., by John Hunter* (1861), which had been saved from Home's unprincipled and barbarous destruction of Hunter's manuscripts, by having been transcribed by Clift, who was the last articled apprentice of Hunter. In the preface to these volumes, Owen showed the advanced views which Hunter entertained in geology and paleontology.

The first appointment of Owen as public lecturer was to the chair of comparative anatomy in St. Bartholomew's hospital in 1834. Two years afterwards, he succeeded sir Charles Bell as professor of anatomy and physiology in the College of Surgeons, and was in the same year appointed by the college as first "Hunterian professor." For 20 years he continued to illustrate the recent and fossil treasures of the museum, until, in 1856, he was appointed superintendent of the natural history department of the British museum, when his connection with the College of Surgeons ceased.

We have not space to record even the principal of Owen's numerous published papers. His earliest communications to the royal society were papers on the generation of the ornithorhynchus and of the kangaroo. In numerous memoirs between 1835 and 1862, he expounded the structure and affinities of the higher quadrumana; and in these and other papers, he proposed the use of the brain-structure, as an important element in classification. It has been objected, that the particular parts to which he referred in characterizing his highest class, are found in the lower classes; but the objectors forget that he does not use the existence of the parts as his characters, but only their remarkable development. A similar objection may be urged against every system of classification, for no decided line can be drawn around any group, the whole animal world being united by a graduation of structure.

His exposition of the recent and fossil birds of New Zealand is well known. He first published two elaborate papers on the anatomy of the apteryx, and then followed at intervals 7 or 8 monographs on the gigantic struthious birds which once existed in these distant islands. His descriptions and restorations of extinct animals are perhaps the most important of all his labors. He has published a monograph of the British fossil mammalia and birds, and 6 parts of an elaborate systematic history of British fossil reptiles. In describing the fragmentary fossil relics brought home by Darwin from South America, he established many remarkable forms from very scanty materials, and showed that there existed in America, during the Tertiary period, a mammalian fauna, the individuals of which were, for the most part, of gigantic size, yet similar in type to the existing animals of that continent. Subsequently, he clearly expounded the various genera of huge sloths from the same region, whose remains were previously confounded or misunderstood. A series of fossils from Australia revealed to him a remarkable group of gigantic marsupials, resembling in type the present tenants of that island-continent. He was the first to expound the structure and affinities of the singular long-tailed bird from Solenhofen. See his well-known *Paleontology* (1861). Amongst his more recent works in this field are *The Fossil Reptilia of South Africa* (1876); *On the Fossil Mammals of Australia, and on the Extinct Marsupials of England* (1877); and *On the Extinct Wingless Birds of New Zealand* (1879).

His great work on the microscopic structure of the teeth must be named. The *Odontography*, published in 1840–45, contains descriptions and exquisite drawings of the minute structure of a very extensive series of the teeth of every class of animals, and forms an immense storehouse of information alike to the anatomist and the geologist.

He published original papers on every branch of the animal kingdom, living and

fossil; and it has been justly said of him, that "from the sponge to man, he has thrown light over every subject he has touched." Some idea of the magnitude of his labors may be formed from the fact, that his published productions amount to more than 300 different papers and works, many of them being of the most voluminous and laborious character.

Owen, in 1835, married the only daughter of Clift, his colleague at the college of surgeons. In 1858, he resumed his position as Fullerian professor of physiology in the Royal Institution of Britain, which, some 20 years before, he had filled for two sessions; and in the following year he was appointed Reade lecturer by the university of Cambridge. He was a fellow and active member of most of the metropolitan scientific societies, one of the eight foreign associates of the institute of France, and an honorary member of many foreign societies. From France he received the order of the legion of honor; from Prussia, the order Pour le Mérite; and from Italy, the order of St. Maurice and St. Lazare. He was made a Companion of the Bath in 1873. D. in 1892.

OWEN, Robert, a social theorist and schemer, was b. May 14, 1771, at Newtown, in Montgomeryshire. He does not appear to have had any more than a merely commercial education to fit him for common business. The point from which his peculiar destiny in life may be said to have started, was his marriage in 1799 to the daughter of David Dale, the owner of the celebrated cotton mills at New Lanark, on the Clyde. This establishment was very successful as a money speculation, and it is curious that Jeremy Bentham made a small fortune by investing in it. Mr. Dale was known to be a thorough man of business, but whether Owen, by his peculiar faculties for organization, contributed to the prosperity of the establishment in its early stages, is a doubtful question. It is certain that as his larger schemes developed themselves, he was felt to be a dangerous partner in a good business, and he was gradually elbowed out of any voice in the management, and he finally disposed of his share in the property.

It should be remembered, however, of a man, whose life will go down to posterity as one long absurdity, that in his connection with the New Lanark mills he did real practical good on a scale by no means limited. He was naturally active and interfering, and being a humane man, it struck him that much degradation, vice, and suffering arose from the disorganized manner in which the progress of machinery and manufactures was huddling the manufacturing population together. He introduced into the New Lanark community education, sanitary reform, and various civilizing agencies, which philanthropists at the present day are but imperfectly accomplishing, in the great manufacturing districts. The mills became a center of attraction. They were daily visited by every illustrious traveler in Britain, from crowned heads downward, and it was delightful not only to see the decency and order of everything, but to hear the bland persuasive eloquence of the garrulous and benevolent organizer.

A factory was, however, far too limited a sphere for his ambition. He wanted to organize the world; and that there might be no want of an excuse for his intervention, he set about proving that it was in all its institutions—the prevailing religion included—in as wretched a condition as any dirty demoralized manufacturing village. Such was the scheme with which he came out on the astonished world in 1812, in his *New Views of Society, or Essays on the Formation of the Human Character;* and he continued, in books, pamphlets, lectures and other available forms, to keep up the stream of excitation till it was stopped by his death. He had at least three grand opportunities of setting up limited communities on his own principles—one at Romney, in America; a second at Orbiston, in Lanarkshire; the third at Harmony Hall, in Hampshire, so lately as the year 1844. They were, of course, all failures, and Owen attributed their failure to their not being sufficiently perfected on his principles. His life was a remarkable phenomenon, from the preternatural sanguineness of temperament which, in the face of failures, and a world ever growing more hostile, made him believe to the last that all his projects were just on the eve of success. In the revolution of 1848 he went to Paris, with hopes of course on the highest stretch; but his voice was not loud enough to be heard in that great turmoil. He appeared at the meeting of the social science association at Liverpool in the autumn of 1858, with all his schemes as fresh as ever. He died a few weeks afterward, on Nov. 19, 1858. A life of Owen by A. J. Booth appeared in 1869 (Trübner).

OWEN, Robert Dale, 1801–77; b. in Glasgow, Scotland; son of Robert Owen (q.v.); educated at New Lanark and in Switzerland. He accompanied his father to the United States, and after the failure of the New Harmony experiment, came to New York, and in 1828 began the issue of the *Free Inquirer*, a continuation of the New Harmony *Gazette*, the publication continuing until 1834. He then returned to New Harmony, and was for three years (1835–38), a member of the Indiana legislature; in 1843 he was elected member of congress as a democrat, served two terms, and was specially active in organizing the Smithsonian Institute, of which he was made a regent. He was chairman of the revision committee having charge of the amendment of the Indiana constitution, 1849–50, and was active in securing the passage of laws giving independent property rights to women. He represented our government as chargé d'affaires and minister, 1853–58, at Naples. During the civil war, Mr. Owen published a number of papers expressing his views in favor of freeing the slaves and maintaining the union. Some of his pamphlets

were extensively circulated by the New York Union League Club and other organizations. For the greater part of his life, Owen was a firm believer in the so-called spiritual phenomena, and on this subject were written *The Debatable Land between this World and the Next* (1872), and *Footfalls on the Boundary of Another World* (1860). He wrote several other books, among which were *Beyond the Breakers* (1870), a novel; *Moral Physiology* (1831); and *Treading my Way* (1874), an autobiographical sketch.

OWEN MEREDITH (*pseud.*). See BULWER-LYTTON, EDWARD ROBERT, EARL.

OWENS, JOHN EDWARD, comedian; b. England, 1824; made his first appearance on the stage at Philadelphia in 1846. *Solon Shingle* was his best-known part. He d. 1886.

OWENS COLLEGE, Manchester, Eng., was founded, 1851, under the will of John Owens, merchant of that city, who left £100,000 for the instruction of young men "in such branches of science and learning as were then and might be thereafter usually taught in English universities." Handsome new buildings have been erected, and the college has now a staff of about 50 professors and lecturers in the two departments of art, science, and law, and of medicine. There are abt. 30 scholarships and prizes and a valuable fellowship. O. C. has been constituted a college of Victoria univ., chartered 1880, which will ultimately be a federation of colleges, having its seat in Manchester, and which, unlike London univ., is at once a teaching and examining body, exacting from intending graduates attendance on a defined course of study.

OWENSBORO, city and co. seat of Daviess co., Ky., on the Ohio river, and the Louisville and Nashville, the Chesapeake, Ohio, and Southwestern, and the Louisville, Henderson, and St. Louis railroads; 40 miles s.e. of Evansville, Ind. It contains a U. S. government building, the Owensboro female college (non-sectarian), national, state, and savings banks, electric light and street railroad plants, waterworks on the Holly system supplied from the river, and several daily and weekly newspapers. The city has several whisky distilleries, and is probably the largest leaf tobacco market in the country. Pop. '90, 9,837.

OWEN SOUND, town, port of entry, and co. seat of Grey co., Ontario, Canada; on Georgian bay at the mouth of the Sydenham river and on the Canadian Pacific and the Grand Trunk railroads; 122 m. n.w. of Toronto. It has an excellent harbor in lake Huron, is surrounded on three sides by wood-crowned heights, and has manufactories of mill machinery, turbine water wheels, agricultural implements, engines, sewing machines, and leather. Pop. '91, 7,497.

OWL, a numerous and extremely well-defined group of birds, constituting the Linnæan genus *Strix*, now the family *Strigidæ*, the whole of the *nocturnal* section of birds of prey. The aspect of the owls at once distinguishes them from all other birds, being rendered very peculiar by the large size of their heads, and by their great eyes, directed forwards, and surrounded with more or less perfect disks of feathers radiating outwards, whilst the small hooked bill is half concealed by the feathers of these disks, and by bristly feathers which grow at its base. The bill is curved almost from its base; the upper mandible not notched, but much hooked at the tip. The claws are sharp and curved, but, like the bill, less powerful than in the *Falconidæ*. The outer toe is generally reversible at pleasure, so that the toes can be opposed two and two, to give greater security of grasp. The wings, although generally long, are less adapted for rapid and sustained flight than those of the diurnal birds of prey, and the bony frame-work by which they are supported, and the muscles which move them, are less powerful; the owls in general taking their prey, not by pursuit, but by surprise, to which there is a beautiful adaptation in the softness of their plumage, and their consequently noiseless flight; the feathers even of the wings being downy, and not offering a firm resisting surface to the air, as in falcons. The soft and loose plumage adds much to the apparent size of the body, and also of the head; but the head owes its really large size to large cavities in the skull between its outer and inner *tables* or bony layers, which cavities communicate with the ear, and are supposed to add to the acuteness of the sense of hearing. This sense is certainly very acute, and the ear is, in many of the species, very large. It is furnished with an external conch, which is found in no other birds. It is, however, concealed by the feathers, being situated on the outside of the disk which surrounds the eye; but the feathers immediately surrounding the ear are arranged in a kind of cone, serving a purpose like that of an ear-trumpet. In some species the ear is furnished with a remarkable lid or operculum, which the bird has the power of opening and shutting at pleasure. The disk which surrounds the eye serves to collect rays of light and throw them on the pupil; and owls can see well in twilight or moonlight, but are generally incapable of sustaining the glare of day, many of them becoming quite bewildered when exposed to it, and evidently suffering pain, which they instinctively seek to relieve by frequent motion of the third eyelid or nictitating membrane of the eye. The legs and feet of owls are feathered to the toes, and in many species even to the claws.

The digestive organs much resemble those of the falconidæ, but there is no crop, and the stomach is more muscular. The gullet is very wide throughout, and owls swallow their prey either entire or in very large morsels. The largest species feed on hares, fawns, the largest gallinaceous birds, etc.; others on small mammalia, reptiles, birds, and sometimes fishes; some feed partly or chiefly on large insects.

The owl has from early times been deemed a bird of evil omen, and has been an object of dislike and dread to the superstitious. This is perhaps partly to be ascribed to

the manner with which it is often seen suddenly and unexpectedly to flit by when the twilight is deepening into night; partly to the fact that some of the best-known species frequent ruined buildings, while others haunt the deepest solitudes of woods; but, no doubt, chiefly to the cry of some of the species, hollow and lugubrious, but loud and startling, heard during the hours of darkness, and often by the lonely wanderer. It is evidently from this cry that the name owl is derived, as well as many of its synonyms in other languages, and of the names appropriated in different countries to particular species, in most of which the sound *oo* or *ow* is predominant, with great variety of accompanying consonants. Many of the owls have also another and very different cry, which has gained for one of them the appellation screech owl, and to which, probably, the Latin name *strix* and some other names are to be referred.

Some of the owls have the disks of the face imperfect above the eyes, the whole aspect somewhat approaching to that of falcons; the conches of the ears small, and the habits less nocturnal than the rest of this family. These constitute one of the three generally received divisions in which the species are arranged. Another division, with more perfect disks around the eyes, is characterized by the presence of two feathery tufts on the head, popularly called horns, or ears, and sometimes egrets or aigrettes. The third division is destitute of these tufts, the disks of the face are perfect, and the ears are very large. On these distinctions, and on the feathered or unfeathered toes, and other points not of great importance, are founded the genera into which the Linnæan genus *strix* has been broken down by recent ornithologists. See, for example, the characters of *Bubo* in the article Eagle Owl.

Owls are found in all parts of the world, and in all climates. Ten species are reckoned as natives of the British islands, some of which, however, are very rare, and about fifteen are natives of Europe. Some of the species have a very wide geographical range. One of the most plentiful British species is the White Owl, or Barn Owl, or Screech Owl (*Strix flammea*), one of those having perfect disks around the eyes, and no aigrettes. It is about 14 in. in its whole length. The tail is, as in most of the owls, rather short and rounded; the wings reach rather beyond the tail. The toes are not feathered. The head and upper parts are of a pale orange color, marked by a multitude of small, scattered chestnut-colored spots, and gray and brown zig-zag lines; the face and throat white. This owl very generally frequents old buildings and out-houses. It destroys great numbers of rats and mice, and deserves the protection of the farmer. The voracity of owls is wonderful, and they kill, if possible, more than they need, storing it up for future use. The barn owl is easily tamed if taken young. When irritated, it has, like some others—perhaps all—owls, a habit of hissing and snapping its mandibles together. It almost never leaves its retreat by day, unless driven out; and when this is the case, all the little birds of the neighborhood congregate about it as an enemy which may then be safely annoyed, and the grimaces of the poor owl, blinded by the too strong light, are very grotesque and amusing. This species has been said to be an inhabitant of almost all parts of the world, but there is reason to think that similar species have been confounded. The Tawny Owl, Brown Owl, or Ivy Owl (*Strix*, or *Syrnium*, *stridula* or *aluco*) is another of the most common British owls, a species about the size of the barn owl, or rather larger, with rather longer tail, and comparatively short wings, the feet feathered to the claws; the upper parts mostly ash-gray mottled with brown, the under parts grayish-white and mottled. The Long-eared Owl (*Strix otus*, or *Otus vulgaris*) and the Short-eared Owl (*S.* or *O. brachyotos*), species with aigrettes, are not unfrequent British birds. The Eagle Owl (q.v.) occurs, but is rare. Of the species with imperfect disks around the eyes and more falcon-like aspect, the most interesting in the British fauna is the Snowy Owl (*Strix*, or *Surnia*, *nyctea*), the *Harfang* of the Swedes, a species occasionally seen in the Shetland islands, and very rarely in more southern regions in winter, but well known in all the very northern parts of the world. It is from 22 to 27 in. in length, feeds on every kind of animal food which it can obtain, and has white plumage spotted and barred with brown, the legs densely feathered to the claws. Of owls not natives of Britain one of the most interesting is the Burrowing Owl (*Strix*, or *Athene*, *cunicularia*), a North American species, which, when necessary, excavates a burrow for itself, but prefers to take possession of those of the marmot, called the prairie dog (q.v.). It is not the only species of owl which inhabits holes in the ground. The Boobook or Bookbook of Australia (*Strix*, or *Noctua*, *Boobook*) is a species of owl, which frequently repeats during the night the cry represented by its name, as if it were a nocturnal cuckoo. Some of the species of owl are small birds; among the rarer British species are one of 8½ in., and one scarcely more than 7 in. long. Some owls are at least partially birds of passage, of which, among British species, the short-eared owl is an example. See illus., Birds, vol. II.

OWLGLASS (Ger. *Eulenspiegel*), Tyll, the prototype of all the knavish "fools" of later time, is said to have been b. in the village of Kneitlingen, in Brunswick. His father was called Klaus Eulenspiegel, and his mother Anna Wortbeck. In youth, we are told, he wandered out into the world and played all manner of tricks on the people whom he met with. His tomb is shown at Mölln, about four leagues from Lübeck, where tradition makes him die about 1350; but the inhabitants of Damme, in Belgium, also boast of having his bones in their church-yard, and place his death in 1301, so that several critics

regard Eulenspiegel as an altogether imaginary person, a mere *nominis umbra* affixed to a cycle of mediæval tricks and adventures. The opinion, however, considered most probable is that Eulenspiegel is not a myth, but that there were two historical individuals of that name, father and son, of whom the former died at Damme, and the latter at Mölln. The stories that circulate in Germany under Eulenspiegel's name were not collected, as the book containing them itself informs us, till after Eulenspiegel's death, and without doubt were originally written in the low German tongue; from low German they were translated into high German by the Franciscan Thom. Murner, and this translation was followed in all the old high German editions of the work. At a later period it underwent considerable alterations at the hands of both Protestants and Catholics, who made it a vehicle for the expression of their own likings and dislikings. The oldest known edition is that printed at Strasburg in 1519. The verdict of modern times has been unfavorable, not only to the æsthetic, but to the moral value of the book; yet although indecencies may be found abundantly in it, they may perhaps in large measure be attributed to the age in which Eulenspiegel, or the author of Eulenspiegel lived. For centuries it has been a favorite people's book, not only in Germany, but in many other countries. Translations of it exist in Bohemian, Polish, Italian, English (as a *Miracle Play*), Dutch, Danish, French, and Latin; it has been frequently imitated, and reprinted times without number down to the most recent years. Max Müller, in his *Lectures on the Science of Language*, points out that Eulenspiegel is the origin of the French word *espiègle*, waggish. When the stories about Eulenspiegel were translated into French, he was called Ulespiègle, "which name contracted afterward into *Espiègle*, became a general name for every wag."

OWL-PARROT, *Strigops habroptilus*, a species of cockatoo found in New Zealand, the *kakapo* or night-parrot of the natives. It is about two and a half ft. in length, and has a dirty green color with black transverse bands and brownish-yellow spots. It has the nocturnal habits and noiseless flight of the owls, and lives in holes at the roots of trees. It feeds on the roots of ferns and New Zealand flax. It breeds in February, laying two or three eggs. In the winter these birds congregate in caves. Their flesh is white and palatable.

OWNERSHIP is not a legal term, though it is used frequently in law to denote the highest degree or kind of property which one can have in anything. Owner is often used in this sense as contradistinguished from an occupier, who has only a temporary interest in the property. Thus a freeholder, or one who holds a freehold estate in land, is an owner; though, in common parlance, it is not unusual also to describe as owner any one who has a long lease of the property. When a person is owner in fee of land, he has certain rights more or less absolute as incidental thereto, for example, he may build on his land as high as he pleases, subject only to doing no direct injury to his neighbor, such as darkening his windows; and he may dig as deep as he pleases, or, as it is said, to the center of the earth. There are certain things which are said to be incapable of ownership, such as the air, the sea, and the water of navigable rivers, as to each of which every individual member of the public has the right merely of using it, but no one has the ownership—i.e., the exclusive right of property as well as possession thereof. As to things wild, such as birds, beasts, fishes, the rule is that he who first catches the animal becomes the owner thereof, and acquires such a property in it that any one who takes it from him against his will commits larceny. But though the person who first catches a wild animal is entitled to it, penalties are sometimes imposed upon the person catching it. See Game Laws; Poaching. In regard to lost property—i.e., property which had once been appropriated and possessed by some one, but who has casually lost or abandoned it—the rule is that he who finds it is entitled to keep it, provided at the time of finding it he had no means of ascertaining the owner. But the true owner, if he discover and can identify the property, can always in general reclaim it from the finder. See Lost Property.

OWOSSO, a city in Shiawassee co., Mich.; on the Shiawassee river and the Ann Arbor, the Detroit, Grand Haven, and Milwaukee, and the Michigan Central railroads; 38 miles s.w. of Saginaw. It is on both sides of the river, which furnishes good power; contains manufactories of furniture, caskets, door and window screens, dining room tables, and hickory handles; and gas and electric lights, electric street railroad, waterworks supplied from springs, several banks, libraries, daily and weekly newspapers, and public schools. Pop. '90, 6,564.

OWY'HEE, a co. in extreme s.w. Idaho, bordering on Utah and Nevada to the s. and Oregon to the w.; drained by Snake river, which forms the n. boundary, and by the Bruneau and other small streams; 7800 sq. m.; pop. '90, 2021. Co. seat, Silver City.

OX, *Bos taurus*, a ruminant quadruped of the family *bovidæ* (q.v.), the most useful to man of all domesticated animals. The species is distinguished by a flat forehead, longer than broad; and by smooth and round tapering horns, rising from the extremities of the frontal ridge. But among the many varieties or breeds which exist, there are great diversities in the length and curvature of the horns, and some are hornless. It is

probable that the ox is a native of both Asia and of Europe, perhaps also of Africa; and not improbable that it may have been domesticated at different times and in different countries. It cannot be confidently asserted that it now exists anywhere in a truly wild state; wild oxen are nowhere so abundant as on the pampas or great grassy plains of South America, where it is certain that they are not indigenous; and it is not impossible that the wild oxen still existing in the parks of a few noblemen in Britain may be also descended from domesticated animals. Whether or not the Urus, described by ancient authors as an inhabitant of central Europe, was the original of the domestic ox will be considered in the article URUS. The very early domestication of the ox is attested by the mention made of it in the writings of Moses, and by the worship of it in Egypt, which the Israelites imitated in making their golden calf at mount Sinai. Yet oxen do not appear to have formed any part of the wealth of the patriarchs. The ox was probably used as a beast of burden or draught before it was valued for its milk. It is mentioned by Cæsar as a principal part of the wealth of the Britons at the time of the Roman invasion.

The ox is more frequently employed as a beast of burden and of draught in some parts of the continent of Europe than in Britain. From the earliest historic times the horse has been more generally thus employed in Britain, and has now almost entirely superseded the ox. The gait of the ox is slow and plodding, but its strength enables it to perform a great amount of work, and it is not easily exhausted. It needs, however, intervals of rest inconvenient for the farmer; and it is not capable of exertion at all equal to that of the horse on any occasion of emergency. The ox is chiefly valuable for its flesh and its milk; but almost every part of the animal is useful—the fat, skin, hair, horns, intestines.

The period of gestation of the ox is nine months, or 270 days. It rarely produces more than one calf at a birth. It attains maturity in two or three years, becomes evidently aged at ten, and seldom lives more than 14. Cows are seldom kept for the dairy after they are seven or eight years old, as after that age they yield less milk and of inferior quality. Modern husbandry has also found means to fatten cattle for the market at an earlier age than was formerly usual; and although the beef is not quite so good in quality, the profit is great, both to the farmer and to the community, through the increased productiveness of the land.

The ox is gregarious, and where circumstances permit, as in the South American plains, associates in very large herds. Herds of oxen defend themselves with great vigor against the large feline animals and other assailants, the younger and weaker animals being placed in the middle, whilst the bulls in the outer rank confront the adversary with their horns.

The varieties or breeds differ very much in size. Among those which occur in the British islands, the Shetland breed is not much larger than a calf of some of the others. Some of the breeds of the torrid zone are also very small; but the fatty hump on the back may probably be regarded as indicating a connection with the Indian ox or zebu (q.v.), which, although it has been generally regarded as a variety of the common ox, is perhaps a distinct species.—The "wild ox," now existing only in a few parks, as at Chillingham and Hamilton, seems, whatever its origin, to have been formerly an inhabitant of many forest districts in Britain, particularly in the n. of England and s. of Scotland. The Chillingham wild oxen are of a creamy white color, much smaller than many of the domestic breeds, of a graceful form, with sharp horns, which are not very long, and not very much curved. The uniform white color is to be ascribed to the care taken to destroy every calf which is not perfect in this respect. The habits of these wild oxen are very similar to those of the domestic races.—The *West Highland* breed, or *Kyloe*, differs very little from the Chillingham or Hamilton wild ox, except in being generally black. It has short muscular limbs, a wide and deep chest, well-arched ribs, and a straight back; the horns are often somewhat long; the muzzle is short but not broad; the skin is closely covered with shaggy hair. The milk is very rich, but the quantity is so small that this breed is very unsuitable for dairy farming. The beef, however, is of the finest quality; and great numbers of cattle, reared in the Highlands and Hebrides, are annually conveyed to other parts of the country, to be fattened on rich pastures. The breed is a very hardy one, and peculiarly suited to the region in which it prevails.—The *Galloway* breed is very like the preceding, but larger and destitute of horns; and many cattle reared in the hilly parts of Galloway are fattened on English pastures for the London market.—The *Pembroke* and other Welsh breeds are not unlike the West Highland; but the cows yield milk more abundantly.—The diminutive *Shetland* breed is very hardy, and is celebrated for the fine quality of its beef. The Shetland ox is easily fattened, even on scanty pasturage. The milk which the cows yield is also remarkably abundant in proportion to their small size.—The *Ayrshire* breed is particularly celebrated for the abundance and excellence of its milk, but the beef is of inferior quality, and the animal is not easily fattened. Great care has been bestowed on this breed in Ayrshire and neighboring counties, where dairy farming is much practiced. The horns are smaller than those of the West Highland breed, the hair much smoother, and the color chiefly brownish-red, with large patches of white.—The *Alderney* breed much resembles the Ayrshire, but the milk is comparatively small in quantity, and remarkable for the richness of the cream, on which account Alderney cows are often

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THE OX.—1. Berne thoroughbred. 2. Swiss thoroughbred. 3. Cow's head. 4. Head o
head. 8. Podolian thoroughbred. 9. Durham short-horn. 10. Scotch hornless t

lgau thoroughbred steer. 5. Dutch thoroughbred steer's head. 6. Cow of same. 7. Cow's
oughbred. 11. Indian zebu. 12. African zebu. 13. Yak.

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kept for the supply of private dairies. The milk of an Alderney cow, mixed with that of a dozen other cows, will sensibly improve the quality of the butter. But this breed is worthless for the purposes of the grazier.—The *Suffolk Dun* is a *polled* or hornless breed, of clumsy form, and of little value to the grazier, but yielding a very large quantity of milk, on which account Suffolk has long been celebrated for its dairy produce.—The *North Devon* is a pretty large breed, with rather short horns, very muscular and powerful, and also very gentle and docile, so that it is particularly adapted for draught; and much agricultural labor is still performed in Devonshire by teams of oxen of this breed. The North Devon breed, however, is surpassed by others, both for the purposes of the dairy farmer and of the grazier.—The *Hereford* breed, of stouter form than the Ayrshire, but in some respects not unlike it, has long been in great repute both for its beef and its milk; but in the districts where it once prevailed, it is now giving place to the *Short-horn* breed, one of the new breeds which are the result of care and attention. The short-horn breed, so called because the horns are shorter than in almost any other, originated about the beginning of the 19th c. on the banks of the Tees, and has spread very widely both in England and in Scotland, in the districts of richest pasturage. The color varies from pure white to bright red; the head is short and very broad; the chest is wide, deep, and projecting; the fore-legs are short, the back straight, and not very long, the "barrel" full. The ease with which oxen of this breed are fattened is one of its great recommendations. The beef is also of excellent quality. For dairy purposes the short-horn is surpassed by some other breeds; but a cross between a short-horn bull and an Ayrshire cow is found useful both for beef and milk. The short-horn breed is now cherished in Britain with peculiar care; genealogies are registered, and prodigious prices are given for first-rate animals. It is also in great esteem in many parts of the continent of Europe, and in America.—The *Long-horn* breed, long prevalent in the midland counties of England, and still prevalent in Ireland, was brought to great perfection by Bakewell, one of the first to show what could be done in the improvement of cattle; but is rapidly giving place to the short-horn, by which it is much excelled. The length of the horns in this breed is very remarkable.

Of foreign races of oxen, one of the most notable, on account of its large size, is that in possession of the Kalmuck Tartars; another is that prevalent in the Roman states, generally of a bluish-ash color, with remarkably large and spreading horns. A large white breed was long kept in Egypt; and a similar breed, without the hump characteristic of the Indian ox, is found in South Africa, where, however, it has become partially intermixed with European breeds. Oxen are much employed by the Kaffers as beasts of burden; they were also formerly trained by the Hottentots to aid them in battle. Peter Kolben, in his account of the cape of Good Hope, written in 1705, gives an interesting description of these trained fighting oxen, which, he says, are called *Backeleyers*. "In the wars of the Hottentots with one another," he says, "these backeleyers make very terrible impressions. They gore, and kick, and trample to death with incredible fury." He ascribes to them also great docility, and states that they know every inhabitant of the kraal, and are perfectly inoffensive towards them, but ready to run with fury at strangers. The readiness with which the draught oxen of South Africa observe the words of the driver, is said to be almost, if not quite, equal to that of the dog. In the training of them, however, severe measures are often requisite, and particularly by a hooked stick inserted through the cartilage which separates the nostrils, as bulls are *ringed* when sent to exhibitions of cattle in Britain. Trained oxen are also employed in the training of their younger fellows. In some parts of Africa the ox is used for riding as well as for draught. The horns, which are very long, are split into ribbons, or curved in various directions to prevent their points from coming in contact, by any accident, with the person of the rider. The pace of the ox scarcely exceeds four or five miles an hour.

A very remarkable conformation of skull occurs in some of the herds of South American oxen, the bones of the nose and the jaw-bones being very much shortened; yet there is no question that this is a mere accidental variation, which has become perpetuated as one of race. Importance has been attached to it in the discussions regarding *species*.

The cow has been for ages tended by man on account of the agreeable and highly nutritious fluid which is obtained from it. Milk is manufactured into cheese and butter, which are capable of being preserved for a considerable time. The processes by which these are obtained are described under the article Dairy. Cows, under our modern systems of agriculture, are selected either for their properties of giving large quantities of milk, or for raising stock which are well suited for grazing and fattening. For milking properties, the Ayrshire breed stands undoubtedly at the head of the list. In comparison with some of the other breeds, the Ayrshire is rather deficient in size, with the flesh spread thinly over its body. In the male animals these characteristics are all the more prominent, and for this reason the breed is not much liked by graziers. It is capable, however, of thriving on secondary or even inferior pastures. Wherever, therefore, it is found most profitable to follow dairy husbandry in Scotland, the Ayrshire cow is preferred. A considerable variety of breeds are cultivated both for milking and grazing in the western parts of England, the principal of which are the Herefords and Devons. In the eastern counties, again, where arable culture and the rearing and feed-

ing of cattle are chiefly followed, the Ayrshire gives place to the Aberdeen, the Angus, and the Teeswater. The cow is there selected for its massive and square-built frame, soft skin, and meat-producing qualities. For more than a century vast care has been bestowed on the improvement of the short-horns. In this breed the pedigrees of the sire and the dam are traced back for many generations, and purity of blood is quite essential in herds of any pretensions. The large sums which particular cows and bulls of this breed realize, attest the value which modern breeders set upon animals which are considered to approach perfection in their form and style. In no department of British agriculture are the results of care and attention more strongly marked than in the noble figure of the short-horned cow or bull.

The rearing and fattening of the ox is one of the most important branches of agriculture. Since the prices of butcher-meat have become so much higher relatively to corn in this country, the breeding and feeding of cattle have received a great impetus. Fifty years ago, many of our old breeds of cattle were kept till they were four or five years old before they were sent fat to the butcher. The demand for meat was so limited then in the n., that most of the cattle were sent s. lean, to be fattened on the pastures and turnips of the eastern counties of England. The introduction of steam-shipping, followed by railways, has given the Scotch breeder and feeder great facilities for disposing of fatted cattle, and now there are no lean cattle sent to the south. Indeed, the extension of green crops in Scotland has been so great that large numbers of lean cattle are imported from England, as well as Ireland, to be fed in the stalls and courts during winter. This applies to the arable districts, where the land does not remain more than one year in grass. In Aberdeenshire, where the land rests from three to four years in grass, more cattle are bred and turned out fat, which is by far the most profitable system, seeing the breeder often gets a larger share of the profits than the feeder. The short-horned blood is in great request to cross with the native breeds, rendering the progeny much easier fattened, as well as causing them to grow to a larger size. It is now the most approved method to feed the calf from the time it is dropped till it is sent to the butcher. Oil-cake is generally considered the best and most healthy auxiliary food for stock, whether old or young. In the pastoral districts of England, where little of the land is cultivated, the rearing of cattle to be sent into the arable districts is carried out. The young animals are fed with hay in winter instead of straw and turnips. Large numbers of cattle are fattened on turnips and mangold in winter in Norfolk and eastern counties. Large allowances of cake and corn are there given in addition to the roots.

ŌXALATES. See Oxalic Acid.

OXA'LIC ACID, $C_2H_2O_4 \cdot 2H_2O$, occurs in colorless, transparent, oblique, rhombic prisms, which have an intensely sour taste, and are soluble in nine parts of cold water, and much more freely in boiling water. When heated to 212°, the crystals lose their two equivalents (or 28.5 per cent) of water, and the residue, consisting of the anhydrous acid, $C_2H_2O_4$, becomes opaque; these two equivalents of water contained in the hydrated acid cannot be expelled by mere heat, although they can be displaced by an equivalent amount of a metallic oxide. When the crystallized acid is rapidly heated to about 300°, it is decomposed into a final mixture of carbonic acid, carbonic oxide, and water; formic acid being produced and again decomposed in the process.

$$\overbrace{C_2H_2O_4 \cdot 2H_2O}^{\text{Crystallized Oxalic Acid.}} = \overbrace{CO_2}^{\text{Carbonic Acid.}} + \overbrace{2H_2O}^{\text{Water.}} + \overbrace{CH_2O_2}^{\text{Formic Acid.}};$$

$$\overbrace{H_2O}^{\text{Water.}} + \overbrace{CO}^{\text{Carbonic Oxide.}}$$

and formic acid when heated yields $H_2O + CO$. When warmed with strong sulphuric acid, it is decomposed into equal volumes of carbonic acid and carbonic oxide gases, and into water; according to the equation:

$$\overbrace{C_2H_2O_4}^{\text{Anhydrous Oxalic Acid.}} = \overbrace{CO_2}^{\text{Carbonic Acid.}} + \overbrace{CO}^{\text{Carbonic Oxide.}} + \overbrace{H_2O}^{\text{Water.}}$$

This reaction affords one of the best means of obtaining carbonic oxide for use in the laboratory. Oxidizing agents, such as binoxide of manganese, peroxide of lead, nitric acid, etc., convert oxalic into carbonic acid, and on this property is based a good method of determining the commercial value of the black oxide of manganese.

Oxalic acid is one of the most powerful of the organic acids, and expels carbonic acid and many other acids from their salts. The acid itself, and its soluble salts, are poisonous. This acid is very widely diffused throughout the vegetable kingdom. Sometimes it occurs in a free state (as in *Boletus sulphureus*), but much more frequently as a salt, either of potash, as in the different species of *oxalis* (from which genus the acid was originally obtained and derives its name), and of *rumex;* or of soda, as in various species of *salicornia* and *salsola;* or of lime, as in rhubarb and many lichens. In the animal kingdom, it never occurs except in minute quantity and in combination with lime.

Oxalate of lime is found in a crystalline shape, both in healthy and morbid urine. In the latter, it constitutes the leading symptom of the affection termed oxaluria (q.v.), while in the former it occurs after the use of wines and beer containing much carbonic acid, of sorrel, rhubarb-stalks, etc., and after the administration of the alkaline bicarbonates. It is the constituent of the urinary calculus, known from its rough exterior as the mulberry calculus. Crystals of oxalate of lime have also been found in the mucus of the gall-bladder, on the mucous membrane of the impregnated uterus, and in morbid blood. They have likewise been detected in the biliary vessels and excrements of caterpillars. In the mineral kingdom these crystals have been detected in association with crystals of calcareous spar.

Oxalic acid is produced by the action of either hydrate of potash or of nitric acid upon most organic compounds of natural occurrence. Its most common mode of preparation is by the oxidation of starch or sugar by nitric acid. The organic compound and the nitric acid are heated in a flask till all effervescence has ceased, after which the solution is evaporated, and the oxalic acid separates in crystals on cooling.

This acid forms three series of salts, viz.: neutral, acid, and super-acid, which, if M represents the metal entering into the salt, may be represented by the formulæ:

Neutral Salt. Acid Salt. Super-acid Salt.

$$\overbrace{M_2C_2O_4}, \quad \overbrace{MHC_2O_4}, \text{ and } \overbrace{MHC_2O_4 \cdot C_2H_2O_4},$$

the last being a compound of the acid salt and the acid. Oxalate of lime, $CaC_2O_4 \cdot H_2O$, and ordinary (neutral) oxalate of ammonia, $(NH_4)_2C_2O_4 \cdot H_2O$, are examples of the first; binoxalate of potash, or salt of sorrel, $KHC_2O_4 \cdot H_2O$, is an example of the second; while the salt usually termed quadroxalate of potash, $KHC_2O_4 \cdot C_2H_2O_4 \cdot 2H_2O$, is an example of the third class. Of the numerous oxalates the most important are the oxalate of lime (in consequence of its physiological and pathological relations); the neutral oxalate of ammonia, which is the best test for the detection of lime in solution (in consequence of the extreme insolubility of the resulting oxalate of lime); and the acid oxalate of potash, which is contained in the juices of *oxalis* and *rumex*, and is employed in various manufacturing processes.

The best test for this acid is the production of a white precipitate (of oxalate of lime), on the addition of any soluble salt of calcium. The precipitate is insoluble in water, in solution of potash, and in acetic acid, but dissolves in the mineral acids. A solution of nitrate of silver also gives a white precipitate of oxalate of silver, which explodes when heated.

In consequence of its employment in cotton printing, bleaching straw, etc., oxalic acid is more accessible to the general public than many other poisons, and on this account instances of suicide from the swallowing of this acid are by no means uncommon. Cases of accidental poisoning, moreover, sometimes occur by its being sold by mistake for Epsom salts. Large doses destroy life very rapidly. Dr. A. Taylor mentions a case in which a man died in 20 minutes after taking 2 oz. of the acid. Dr. Christison records a case in which an ounce killed a girl in 30 minutes, and another case in which the same quantity destroyed life in ten minutes; and, as a general rule (liable to exceptions), when the dose is half an ounce or upward, death commonly takes place within the hour. The symptoms are a hot or burning acid taste, with a sense of constriction or suffocation; vomiting, great pain in the region of the stomach, convulsions, cold perspirations and general collapse speedily follow; and respiration shortly before death becomes slow and spasmodic. With the view of converting the free acid in the stomach into an insoluble and inert salt, chalk, whiting, or lime-water, with full draughts of milk, should be administered with the least possible delay. Salt of sorrel is almost as poisonous as the pure acid.

OXALI'DEÆ, or OXALIDA'CEÆ, a natural order of exogenous plants, allied to *geraniaceæ;* including herbaceous plants, shrubs, and trees; with generally compound alternate leaves; calyx of five equal persistent sepals; corolla of five equal unguiculate petals, spirally twisted in bud; ten stamens, usually more or less united by the filaments, in two rows; the ovary usually 5-celled, with five styles; the fruit a capsule opening by as many or twice as many valves as it has cells, or more rarely a berry; the seeds few, attached to the axis. There are upwards of 300 known species, natives of warm and temperate climates. They are particularly abundant in North America and at the cape of Good Hope. The flora of Britain includes only two small species of *oxalis*. An acid juice is very characteristic of this order. Some of the tropical species produce agreeable acid fruits, as the carambola (q.v.).—The genus *oxalis* has a capsular fruit, and the seeds have an elastic integument, which at last bursts open and projects the seed to a distance. The species are mostly herbaceous plants with ternate or digitate—rarely simple or pinnate—leaves; a few are shrubs. The stems and leaves generally contain a notable quantity of *binoxalate of potash*, and have therefore a sour taste.—The COMMON WOOD-SORREL (*O. acetosella*), very abundant in shady woods and groves in Britain and most parts of Europe, a native also of North America, is a beautiful little plant, often covering the ground with its green leaves, amidst which the white or slightly roseate flowers appear. Its leaves all grow from the root, a long leaf-stalk bearing three obovate leaflets; the scape bears a single flower. There is a subterranean scaly root-stock. On

account of their grateful acid taste the leaves are used in salads and sauces. The plant is extremely abundant in Lapland, and is much used by the Laplanders. It is anti-scorbutic and refrigerant, and an infusion of it is a grateful drink in fevers. *Binoxalate of potash* is obtained from the leaves by expressing the juice and crystallizing; and is sold not only under the name of *salt of sorrel*, but also of *essential salt of lemons*, and is used for extracting spots, and particularly iron-marks, from linen and for other purposes. Much of it is now, however, obtained from a very different source. See OXALIC ACID.—*O. corniculata*, rare in Britain, and almost confined to the south of England, but a plant of very extensive distribution, being found in Europe, North America, India, Japan, and some of the African islands, has a branched stem, with decumbent branches, leaves very similar to those of the common wood-sorrel and yellow flowers. Its properties agree with those of the common wood-sorrel. Many other species resemble these in their general appearance and properties. Some of the species exhibit an irritability like that of the sensitive plant; generally, as in the two British species, in a slight degree, and notably only in hot sunshine, but *O. sensitiva*, an East Indian species, with pinnate leaves, possesses this property in a high degree. Some species of *oxalis*, as *O. cernua*, a native of South Africa, are remarkable for producing large bulbils in the axils of the lower leaves. Several species have tuberous roots, and are cultivated on account of their tubers; as *O. crenata* and *O. tuberosa*, natives of Peru and Bolivia, where they are much esteemed, and both receive the name OCA. The tubers when cooked become mealy like potatoes. They have a slightly acid taste. *O. crenata* has been cultivated in gardens in Britain for about 30 years, but continues to be almost exclusively an object of curiosity, being too tender for the climate, and its produce very inconsiderable in quantity. Its tubers are yellow, in size and shape like small potatoes. The succulent stalks of the leaves abound in a pleasant acid juice, and make excellent tarts and preserves. *O. tuberosa* produces numerous small tubers. The Bolivians often expose them for a long time to the sun, by which they lose acidity, become saccharine, and acquire a taste and consistence like dried figs. *O. Deppei* is a Mexican species, with a root somewhat like a small parsnip, quite free of acidity. It is much cultivated in its native country, and succeeds well in the southern parts of England. *O. tetraphylla* and *O. crassicaulis*, natives of Mexico, and *O. enneaphylla*, a native of the Falkland islands, also have eatable roots. Many species of *oxalis* are much esteemed as ornaments of gardens and green-houses. See illus., FLOWERS, vol. VI.

OX'ALIS. See OXALIDEÆ.

OXAL'URIA, or THE OXAL'IC ACID DIATH'ESIS, is a morbid condition of the system, in which one of the most prominent symptoms is the persistent occurrence of crystals of oxalate of lime in the urine. These crystals most commonly occur as very minute transparent octohedra, but sometimes in the form of dumb-bells; in order to detect them the urine, which usually in these cases presents a mucous cloud, should be allowed to stand for some hours in a conical glass, and after the crystals have gradually subsided, the greater part of the fluid should be poured away, and the drops remaining at the bottom examined with a power of not less than 200 diameters. These crystals, which are insoluble in acetic acid, may occur either in acid or in alkaline urine. Persons who secrete this form of urine are usually dyspeptic, hypochondriacal, and liable to attacks of boils, cutaneous eruptions, and neuralgia. The oxalic acid in these cases is not introduced into the system with the food, but is a product of the disintegration of the tissues, and is due to the imperfect oxidation of compounds, which should normally have been converted into carbonic acid. (Anhydrous oxalic acid, $C_2H_2O_4$, obviously requires one atom of oxygen to convert it into carbonic acid, $2CO_2$, and water, H_2O. Hence, if this necessary amount of oxygen is wanting in the system, in consequence of imperfect oxygenation of the blood, oxalic acid, in combination with lime, appears as a final excretion in place of carbonic acid.) The occurrence of oxalic acid as a persistent sediment in the urine is not only an indication of an existing morbid condition of the system, but may give rise to two perfectly distinct dangerous complications; (1) a concretion of oxalate of lime (mulberry calculus) may be formed either in the kidney or the bladder; and (2) bad consequences may arise from the poisonous action of the oxalic acid on the digestive organs, on the heart, and on the nervous system.

The treatment is simple. Care must be taken that the patient should avoid articles of diet containing oxalic acid (such as sorrel, rhubarb, tomatoes, etc.), or readily converted into it (such as sugar), and all drinks containing much carbonic acid; while he should take plenty of exercise in the open air without fatiguing himself; should use the shower-bath, unless he feels chilled and depressed after its application, in which case he should rub the body all over daily with a horse-hair glove; and should employ as a tonic medicine either a little nitro-muriatic acid in a bitter infusion (20 minims of the acid in an ounce and a half of infusion of chyretta), or five grains of citrate of iron and quinine three times daily. Under this treatment the oxalates usually almost entirely disappear from the urine in two or three weeks.

OXENBRIDGE, JOHN, 1609–74; b. Daventry, Eng.; educated at Oxford and Cambridge, taking his degree at the latter university in 1631; was tutor of Magdalen hall, Oxford; but deprived of the position in 1634 for persuading the students to subscribe certain religious articles prepared by himself; was ordained a minister of the

church of England, and spent the next few years as a missionary in the Bermuda islands. In 1642 he was chosen fellow of Eton college, and in 1644 installed pastor of a church in Beverly. He was afterwards settled at Berwick-on-Tweed, and in 1662 was silenced for nonconformity by the Bartholomew act. He then went as a missionary to Surinam, Guiana, where he labored for some time. In 1667 he visited Barbadoes, and in 1669 came to Boston, where he was installed in 1670 as colleague of the Rev. James Allen over the First church of that city, remaining there until his death. Though much engaged in religious controversy he was a popular and useful preacher. His publications are, *A Double Watchword; Election Sermon; Seasonable Seeking of God; A Proposition for Propagating the Gospel by Christian Colonies in the Continent of New Guiana.*

OXENDEN, Ashton, D.D.; b. at Broome Park, near Canterbury, Eng., 1808; educated at the University college, London; for many years rector of Pluckly-with-Pevington, in Kent. In 1864 he became honorary canon of Canterbury cathedral, and in 1869 was chosen bishop of Montreal, and primate and metropolitan of Canada. He resigned his bishopric, 1878, because of age, and was vicar of St. Stephen's, Canterbury, 1879–85. Among his numerous publications are, *Plain History of the Christian Church; Barham Tracts: The Pastoral Office; Baptism and the Lord's Supper simply explained; Lectures on the Gospels.* He d. in 1892.

OXENSTIERNA, Axel, Count, an illustrious Swedish statesman, was b. at Fanö, in Upland, June 16, 1583. He was originally educated for the church, and studied theology as well as jurisprudence at Rostock, Jena, and Wittenberg, in the last of which universities he took his degrees. Although he afterwards devoted himself to public affairs, he continued all his life to take a deep personal interest in religious questions, and labored zealously for the extension of the Protestant doctrines. After leaving the university, he visited most of the German courts, but returned to Sweden in 1603, and soon afterwards entered the service of Charles IX., who, in 1606, dispatched him as ambassador to the court of Mecklenburg. He became a senator in 1608—a dignity which had been enjoyed by thirteen of his predecessors in uninterrupted succession. Having displayed great prudence and wisdom in the settlement of certain disputes between the Livonian nobles and the town of Reval, he was appointed by Charles—now infirm from age—guardian of the royal family, and head of the regency. On the accession of Gustavus Adolphus (q.v.), in 1611, Oxenstierna was made chancellor; and in 1613, acted as minister-plenipotentiary in the negotiations for peace between Sweden and Denmark. In the following year he accompanied his sovereign to Poland, and by the peace of Stolbova, in 1617, terminated hostilities between Sweden and Russia. His political sagacity was not less conspicuously shown in his successful efforts to prevent Gustavus from marrying Ebba Brahe, a Swedish beauty, and in bringing about a match between his master and the princess Maria-Eleonora of Brandenburg. In 1621, on the departure of the king for the Polish war, he was charged with the administration of affairs at home, which he conducted with his invariable felicity; subsequently he was appointed governor-general of the conquered districts; and in 1629 concluded peace with the Poles on highly favorable conditions. For a while Oxenstierna strongly opposed the desire of Gustavus to take part in the "thirty years' war;" his hope being to see the latter arbiter of the n. of Europe; but when he found that the Protestant sympathies of the king were irrepressible, he set about collecting money and troops for the perilous enterprise, with all the quiet but wonderful activity and persistency that so remarkably characterized him. After Gustavus had fairly entered on the bloody struggle, Oxenstierna joined him, and conducted most of the extensive and complicated diplomacy which the course of events entailed on Sweden. The death of Gustavus for a moment paralyzed him, but he instantly recovered, and heroically resolved to continue the contest with the imperialists, in spite of the visible disaffection of many of the German Protestant princes, among others, of the elector of Saxony. The will of the dead monarch was sent to Stockholm; according to its conditions, the government—during the minority of Christina (q.v.)—was intrusted to five nobles, who empowered the chancellor to prosecute the war. His difficulties were enormous, yet by indefatigable efforts he managed partly to allay the discontents, jealousies, and rivalries of the Protestant leaders. The disastrous defeat of the Swedes at Nordlingen in 1634, and the perplexities which followed it, would have stupified most men in the position of Oxenstierna, but it only called out more energetically his splendid diplomatic genius. Transferring the leadership of the Protestant forces to Duke Bernhard (q.v.) of Weimar, he proceeded, in 1635, to France and Holland, and formed alliances with these countries. Returning to Germany, he assisted in quelling a mutiny among the Swedish troops at Magdeburg; put Pomerania in a state of defense, to resist the mediated attack of the elector of Brandenburg; renewed the treaty with Poland; and leaving Baner in command of the Swedes, returned to Stockholm in 1636, where he was received with the liveliest enthusiasm. He still continued, however, to direct ably the policy of the Protestants in Germany, till the peace of Westphalia, in 1648, put an end to the war. Oxenstierna's son was one of the Swedish envoys who signed the treaty, and it is in a letter to him that the famous sentence of the statesman occurs, *Nescis mi fili, quantilla prudentia homines regantur*—("You do not yet know, my son, with how little wisdom men are governed.") Christina, who had been declared of age in 1644, did not show a proper

respect for the advice of Oxenstierna; and after she had—through mere feminine wilfulness—abdicated, in spite of all his protestations, he withdrew from public life, and died Aug. 28, 1654, shortly after she had left Sweden. He entertained a genuine affection for the daughter of his noble master, and in his last moments her name was upon his lips. Some treatises and historical fragments are attributed to him, and his "journal" has been published in the *Stockholm Magazine*. See Lundblad's *Svensk Plutarch* (2 vols. Stock. 1824); Fryxell's *History of Gustavus Adolphus;* and Geijer's *History of Sweden.*

OX-EYE. See CHRYSANTHEMUM.

OXFORD, a co. in s.w. Maine, bordering on New Hampshire, drained by the Saco and Androscoggin rivers; containing several large lakes, among which are Molechunkemunk, Parmachena, and Mooselucmaguntic; traversed by the Portland and Rumford Falls and Grand Trunk railroads; 1892 sq. m.; pop. '90, 30,586, chiefly of American birth. The surface is mountainous, but in the valleys fairly fertile. The staples are wheat, buckwheat, corn, dairy products, maple sugar, and hay. There are over 80 factories of various kinds in the county. Co. seat, Paris.

OXFORD, a co. of Canada in s.w. Ontario, drained by the Thames and smaller rivers, and traversed by the Grand Trunk and the Michigan Central railroads; 760 sq. m.; pop. '91, 48,552—North Oxford 26,131, South Oxford 22,421. Co. seat, Woodstock.

OXFORD, an ancient and famous city and seat of learning in England, the chief town of the co. of Oxford, is situated on the n.e. bank of the Isis, a tributary of the Thames, a little above the point where it is met by the Cherwell. Both streams are crossed by numerous bridges, of which the finest are Folly bridge over the Isis, and Magdalen bridge over the Cherwell. Lat. of the city, 51° 45′ 55″ n., long. 1° 15′ 29″ w. Distance from London, 52 m. w.n.w. Pop. '91, 45,472. Oxford occupies an undulating site, is surrounded by rich and wooded meadows, and presents to the eye of the approaching visitor a scene of unequaled architectural magnificence—spires, and towers, and domes rising as thickly as chimney-stalks in the manufacturing towns of Lancashire or Yorkshire. The four main streets of Oxford meet at right angles near the center of the town, at a place still called Carfax, a corruption of *Quatre voies,* and which appears in Agas's map (*temp.* Elizabeth) as *Cater voys.* These are—Cornmarket street, leading into St. Giles's, and running due n.; Queen street, leading to the railway stations, and running w.; St. Aldate's street, leading to the Isis, and running due s.; and High street, which is the chief street of the city, gracefully curving in an easterly direction, and conducting to the river Cherwell, a smaller river joining the Isis soon after it has passed Oxford.

The western half of the town is the most uninteresting; and it is a misfortune that the railway stations are placed here, as travelers, on arriving, are introduced to the meanest parts of the city first. The county courts and jail, and the remains of the castle, from which the empress Maud escaped while it was besieged by King Stephen, will be observed in passing. There is one good street in this part, viz.: Beaumont street, built on the site of the ancient Beaumont palace, in which Richard I. was born. At the end of this street is Worcester college. Passing to the n. from Carfax, along the Cornmarket, the old tower of St. Michael's church is seen, against which stood formerly the n. gate of the city; next St. Mary Magdalen church; then the martyr's memorial, with the Taylor buildings and Randolph Hold on the left, and part of Balliol college and St. John's college on the right. St. Giles's church is at the n. end of this street, which is very wide, and has a row of elm trees on each side, forming a picturesque avenue like a foreign *boulevard.* Beyond this, to the n., is the Radcliffe observatory and infirmary. The High street is about 1000 yds. in length; it is reckoned one of the noblest streets—architecturally considered—in Europe, and contains, among other edifices, part of the buildings of Magdalen college, Queen's college, All-Soul's college, University college, and St. Mary's and All-Saints' churches. Parallel to it is Broad street, in which are situated Balliol, Trinity, and Exeter colleges, the Ashmolean museum, the Clarendon rooms, the Sheldonian theater, and close by are the Academical schools, the Bodleian library, and the picture gallery. In St. Aldate's street, which forms the southern part of the series of streets already mentioned as forming one line, and running n. and s. is Christ Church college (the entrance tower of which contains the great bell "Tom of Oxford," weighing upwards of 17,000 lbs.) and St. Aldate's church. The other colleges and important buildings connected with the university of Oxford lie back from the principal streets. To attempt particularizing the architectural characteristics of each of these edifices is impossible within our limits. It may suffice to say, that though there is nothing extraordinarily fine about the architecture of the colleges, regarded individually, yet the vast number of the structures and variety of styles present a *tout-ensemble* that is altogether sublime. The effect is wonderfully heightened by the interspersion of gardens, meadows, and venerable trees—old as the buildings that tower above them. Christ church is celebrated for its magnificent hall, picture gallery, and library, as well as for its extensive grounds; its chapel, the cathedral church of Oxford, is Norman in style, but is inferior, both in size and beauty, to most English cathedrals. Merton college is situated a little to the s. of the High street, and still retains the original chapel

and part of the other buildings erected by Walter de Merton in the 13th century. Magdalen college retains its celebrated cloister and tower of the 15th c., and the buildings here are the most complete of any college in Oxford. Oriel college, a comparatively modern structure, is very picturesque, but far from chaste in its design; New college ranks among the noblest buildings in the city—"the chapel, the hall, the cloisters, the groined gateways, and even some original doors and windows remain, in their exterior at least, as they came from the hand of their master architect," William of Wykeham, 500 years ago; Queen's college is built in the Grecian style of architecture, with a spacious and handsome chapel and a fine library; so is Trinity college; University college is a not unpleasing mixture of Gothic and Italian; Exeter college has a splendid frontage on the w., and its chapel (built 1857–58), in the Gothic style, is the finest modern building in the city; it has also an excellent hall, and a beautiful library; Balliol college has a remarkably fine chapel, built only a few years ago. Among the other churches in Oxford, besides the cathedral church and the college chapels, are—St. Mary's, which is attended by the members of the university; St. Martin's, the church of the crrporation of Oxford; St. Peter's-in-the-East, with a Norman crypt; St. Michael's, with a Saxon tower; and St. Aldate's. The chief buildings connected with the university, besides the Bodleian and the Ashmolean museum already mentioned, are the Radcliffe library, a circular structure, adorned with Corinthian columns and surmounted by a dome; the Radcliffe observatory, crowned by an octagonal tower, in imitation of the temple of the Winds at Athens; the University printing-office, and the Taylor Institution, founded "for the teaching the European languages"—an exceedingly handsome and extensive range of buildings. The botanic gardens are situated not far from the Cherwell, and nearly opposite Magdalen college. Other notable buildings, not connected with the university, are—the town hall, the Radcliffe infirmary, the co. jail, and one or two dissenting places of worship, such as the Wesleyan chapel in New Inn Hall lane, and the Independent chapel in George lane.—The city of Oxford is a mart for the disposal of the agricultural produce of the neighboring country, but has little trade of its own, and is dependent for its prosperity chiefly on the university. It is a municipal and parliamentary borough, and governed by a mayor, nine aldermen, and thirty councilors, whose jurisdiction, however, does not embrace the university. Both the city and the university send two members to parliament.

Oxford, by the Saxons called Oxnaford, and in the *Domesday Book*, Oxeneford (probably from its having been originally a ford for the passage of oxen), is a place of great antiquity. The date of its origin is unknown, but as early as the 8th c. there was a nunnery established here; and in 802 an act of confirmation by Pope Martin II. describes it as an ancient seat of learning. It is said to have been a residence of king Alfred, and also of Canute, who held several parliaments within its walls. The townsmen closed their gates against William the Conqueror, who stormed the town in 1067. and gave it to one of his followers, Robert d'Oyley, who built a castle here to overawe the disaffected Saxons, some ruins of which are still to be seen. The paction that terminated the strife between Stephen and Henry II. was drawn up at Oxford. In the reign of Edward III. the preaching of Wyckliffe excited great commotion among the students, and threatened well-nigh the dissolution of the university. In the reign of the "Bloody Mary" it witnessed the martyrdoms of Ridley, Latimer, and Cranmer: and during the great civil war of the 17th c. it was for a while the head-quarters of the royalist forces, and was conspicuous for its adherence to Charles I. Ever since that period the city—or, at any rate, the university—has been in general characterized by an extreme devotion to the "church" and the "king."

OXFORD, a township in Warren co., N. J., including the town of Oxford. Pop. '90, 4002.

OXFORD BLUES. See Horse Guards, Royal.

OXFORD CLAY, the principal member of the middle oolite series, is a bed of stiff dark-blue or blackish clay, sometimes reaching a thickness of 600 feet. There occur in its lower portion in some places layers of tough calcareous sandstone, called Kelloway rock, from a place in Wiltshire, where it is quarried. The Oxford clay lies beneath the plain on which Oxford is built, and extends s.w. and n.e. from the shore at Weymouth to the fen lands s. of the Wash, thence it may be traced through Lincoln into Yorkshire, until it disappears under the sea at Scarborough. The close packing of the fossils in the fine compact clay has caused them to be beautifully preserved; the shells frequently retain their iridescence, and even the softer parts of the cephalopods have sometimes left with tolerably clear definition their form in the clay. The fossils are, however, often filled with iron pyrites, which, on exposure to the atmosphere, readily decomposes and destroys all traces of the beautiful organism. The remains of chambered shells of the genera belemnites and ammonites are very abundant, and with them are associated other shells, interesting crustacea, and the species of fishes and reptiles which are characteristic of the oolite.

OXFORDSHIRE, an inland county of England, bounded on the s. by the river Thames, on the e. by Bucks, and on the w. by Gloucestershire. Area, 483,614 acres. Pop. '91, 185,669. The surface, where it is not level, is undulating. In the n.w. the hills rise in Broom hill to 836 ft. above sea level, and in the s.e. of the county are the Chiltern hills (q.v.), rising near Nutfield to 820 ft. in height. It is watered along its

southern border by the Thames, and the other chief rivers are the Windrush, Evenlode, Cherwell, and Thame, affluents of the Thames. By means of the Oxford canal, which joins the Thames at Oxford, the towns and districts lower down the river (Abingdon, Wallingford, etc.) are supplied with coal from the Leicestershire coal-fields. The soil is fertile; the state of agriculture is advanced, a very large proportion of the acreage being under crops, fallow, or grass; and the county may be considered one of the most productive in the country. Three members are returned to the house of commons for the county.

OXFORD TRACTS. See TRACTARIANISM.

OXFORD UNIVERSITY is said to have been founded by King Alfred. Without claiming for it an origin quite so ancient, it is certain that from very early times students resorted to Oxford in order to attend lectures there delivered by learned men, and that they lived in the houses of the towns-people. In some cases they combined together, so as to secure the service of a common teacher, with whom they lived in a large tenement called an inn, hostel, or hall. For a long time, however, the great majority of the students lodged in rooms hired from the citizens; and as late as the year 1512, regulations were made for the governance of such students. As their numbers increased, the halls were multiplied. Anthony Wood states that he could show the names and places of more than a hundred. A great diminution in the numbers of the students took place about the middle of the 15th century. This, among other causes, led to the gradual disappearance of the halls, which were bought up by the wealthier colleges. Only five of the halls now exist, which differ from the colleges only in that they are unincorporated, and have little or no endowments. Residence in private lodgings had also fallen into disuse; and by the time of Queen Elizabeth it had become a compulsory rule that all undergraduates should reside in some college or hall, at least for the first twelve terms of residence. Now, however, undergraduates may in most colleges live in lodgings from the beginning of their course.

The colleges were founded at various periods from the end of the 13th c. to the beginning of the 18th. Fourteen out of the 21 were founded before the reformation. Their object originally was to support limited societies of students, who were to devote their lives to study—by no means, as at present, to educate large classes of the community. Students, other than those on the foundation, seem not to have been regarded by the founders as an essential part of the college. The colleges arose, as has been already said, partly instead of the old halls, and were partly at first connected with the monasteries, it being by means of these institutions that benevolent persons were enabled to give permanent support to poor secular scholars. University and Balliol, which now rank as the oldest colleges, were in point of fact halls supported by endowments held in trust for the maintenance of their students. The originator of the collegiate system, in anything like its present form, was Walter de Merton, who, besides having founded Merton college, is entitled to the honor of having mainly contributed to fix the university in its present site. All those on the foundation of the colleges before the reformation were called clerici. The great majority of the fellows were required to take priest's orders within a certain period after their election. This requirement of course involved celibacy, which, besides, was expressly imposed in some colleges; and practically, in old times as now, was enforced by the rule of life and the obligation of residence. Within the last few years in some of the colleges the restriction of celibacy has been, under certain conditions, remitted in the case of fellows engaged in college work.

Under a statute passed in 1868 any person may now become a member of the university without becoming a member of a college or hall, provided he satisfies certain disciplinary requirements. For such purposes these unattached students are under the control of a board of delegates; but no special provision is made for their instruction. In 1871 the new foundation of Keble College, built in memory of John Keble, was admitted to enjoy the same privileges (save as regards the academical status of its head) as were possessed by the other colleges and halls.

Previous to the statute 17 and 18 Vict. c. 81 the constitution of the university was as follows: 1. The hebdomadal board, or weekly meeting, consisting of the heads of houses and the two proctors, which body exercised the chief share of the administration of the university, and possessed the exclusive power of initiating legislation; 2. Congregation, consisting of certain university dignitaries, which met merely for the purpose of conferring degrees; 3. Convocation, consisting of all masters of arts, a body whose consent was necessary before any of the measures proposed by the hebdomadal board could become law, which elected the chancellor, the two representatives of the university in parliament, several of the professors, and dispensed the ecclesiastical patronage of the university. The statute referred to introduced important changes. The hebdomadal board has been changed into the hebdomadal council, consisting of the chancellor, the vice-chancellor, the proctors, six heads of houses, six professors, and six members of convocation of not less than five years' standing—such heads, professors, and members of convocation being elected by congregation, and holding office for six years. Congregation, again, now consists of all the great officers of the university, the professors, the public examiners, and all resident masters; and on this body is now bestowed the power of accepting or rejecting, and of amending any statute framed by the hebdomadal council. The composition and powers of convocation remain unchanged. The students

not on the foundation are for the most part commoners. In Worcester College and the halls there is still a class of fellow-commoners, who pay large fees, and enjoy certain privileges. They mainly consist of men above the ordinary age of undergraduates, who wish to have the intellectual advantages of the university without being subjected to the common routine of discipline. All other formal distinctions due to wealth or poverty are almost entirely abolished, such as the special privileges of peers, and the regard had to the poverty of candidates in the case of certain scholarships. It is very difficult to ascertain the actual number of students at any one time in Oxford, but now it is probably seldom above 1800.

There are four terms in each year—viz., Michaelmas term, which begins on Oct. 10, and ends on Dec. 17; Hilary term, which begins on Jan. 14, and ends the day before Palm Sunday: Easter term, which begins on the Wednesday in Easter-week, and ends on the Friday before Whitsunday; Trinity term, which begins on the Saturday before Whitsunday and ends on the Saturday after the first Tuesday in July. Full term, as it is called, does not begin till the first day of the week, after the first congregation is held. By undergraduates, Michaelmas and Hilary terms are kept by six weeks' residence, and Easter and Trinity terms by three weeks each; but more than this is required by most of the colleges. Twenty-six weeks may be taken as the ordinary *length of the academic year*. Twelve terms of residence are required for the degree of B.A. from all. The degree of M.A. is obtainable in the twenty-seventh term after matriculation. By a statute passed in 1850, the following examinations were made necessary for a degree in arts; but their nature has been considerably changed by the new statutes which came into effect 1873–74: 1. Responsions, called "little go" or "smalls" in the familiar language of undergraduates, are obligatory upon all. The university does not, as to this or any other pass examination, fix a limit of time within which they must be passed; but most colleges require their members to pass responsions, at least within their first year of study. Subjects: one Latin and one Greek author—or portions of them, as five books of Homer, five of Virgil, two Greek plays, etc.—with a paper of grammatical questions; a piece of English to be translated into Latin; two books of Euclid, or algebra up to simple equations inclusive; and arithmetic. 2. The first public examination, or moderations, is also obligatory upon all. Candidates must have entered upon their fourth term. Subjects: the four gospels in Greek (except in the case of persons not members of the church of England, when some one Greek author is to be substituted); one Greek and one Latin author, not the same as those offered for responsions, and one must be a poet, the other an orator; a piece of English into Latin, and a paper of grammatical questions; logic, or Euclid III. and IV., 1–9, and algebra. Honors are awarded at this examination both in classics and pure mathematics. Candidates are recommended to take up especially poets and orators. Verses, as well as Greek and Latin prose-writing, and a paper of grammatical and philological questions, are set. In the mathematical school, which in this examination exists as a separate school for honors only, candidates are examined in pure mathematics up to the integral calculus and the calculus of finite differences inclusive. 3. The second public examination held twice a year, to be *passed* not earlier than the 12th term, and for honors not later than the 16th term of standing; unless the candidate has been classed in some other school of the second public examination, in which case he may be admitted up to the 20th term inclusive. This examination consists of three parts: (1.) an examination in the rudiments of faith and religion, or in the case of those who (or whose guardians) object to such examination, certain substituted books or subjects; (2.) an examination of those who do not seek honors; and (3.) an examination for those who do seek honors. In this last there are, in Oxford phraseology, six schools: literæ humaniores, mathematics, natural science jurisprudence, modern history, theology. Candidates are entitled to a degree of B.A. who having passed the two previous examinations, also passed the examination appointed for those who do not seek honors, or who obtain honors in any one of the six honor schools. But every candidate, except he has obtained honors in the theology school, must have satisfied in the rudiments of faith and religion or the substitute. By these rudiments are understood the Old and New Testaments (gospels and acts of the apostles in the original Greek); and the 39 articles. The pass examination embraces subjects chosen from at least two out of the three following groups: (*a*) Greek and Roman history and philosophy; (*b*) English, modern languages, political economy and law; (*c*) geometry, mechanics, chemistry, and physics. Out of these the candidates must select three subjects, one of which must be either (1) ancient philosophy and history (in the original Greek, or Greek and Latin); or (2) a modern language (French or German). The classical books must be other than those offered for responsions and moderations. Candidates for honors may select any one, or more than one of the six schools. The most popular and influential of these is the school of literæ humaniores. The examination in this school includes (1) the Greek and Latin languages; (2) the histories of ancient Greece and Rome; (3) logic, and the outlines of moral and political philosophy. Candidates may also offer certain special subjects in any of these three departments. The republic of Plato and the ethics of Aristotle form the basis for philosophical study, though they are every year more largely supplemented by modern philosophy. Next in the numbers of its candidates is the school of modern history, which includes (1) the continuous history of England; (2) general history during some period, selected

by the candidate, from periods to be named from time to time by the board of studies· (3) a special portion of history, or a special historical subject, carefully studied with reference to original authorities. The school of jurisprudence includes (1) general jurisprudence; (2) the history of English law; (3) some department of Roman, and it may be, of English law; (4) international law, or a specified department of it. The school of mathematics embraces pure and mixed mathematics (algebra, trigonometry, calculus, mechanics, optics, astronomy). The school of natural science has a double examination for honors—a preliminary and a final. The preliminary examination, incumbent upon all, is restricted to the elementary parts of mechanics, physics, and chemistry. In the final examination, the candidate may offer himself for examination in one or more of the three general subjects of physics, chemistry, and biology. The examination in the honor school of theology includes the Holy Scriptures, dogmatic and symbolic theology, ecclesiastical history and the fathers, the evidences of religion, liturgies, sacred criticism, and the archæology of the Old and New Testaments. A knowledge of Hebrew will have weight in the distribution of honors. The organization of these schools is at present the main function of the university, as distinct from the colleges. Professorial teaching on its own account only exists to a very limited extent. In the main, the teaching power of the colleges is devoted to preparing their undergraduate members for these various examinations.

Examinations also take place for degrees in law, medicine, divinity, and music; but these are in great measure formal. The examinations for degrees in arts are the proper work of the university.

Besides these honors, various distinctions are conferred by the university. There are several university scholarships, more particularly the Vinerian law fellowships and scholarships; the Eldon law scholarship; one Sanskrit and two Hebrew scholarships yearly; two mathematical scholarships; the Hertford scholarship, for the encouragement of the study of Latin, and the Ireland and Craven scholarships, for the encouragement of the study of classics. There is also the Newdigate prize for the best composition in English verse; and the three chancellor's prizes for the best compositions in Latin verse, Latin prose, and English prose; the Gaisford prizes for Greek composition; and the Arnold, Stanhope, and marquis of Lothian's prizes for the best essays on an historical subject. But the great prizes are the scholarships and the fellowships. By the commissioners under 17 and 18 Vict. c. 81, these have been for the most part thrown open, and are now awarded after examination without restriction as to kin or place of birth. At All-Souls, and also at St. John's College, since the labors of the commissioners, an attempt has been made to keep up the former exclusiveness. The scholarships, which are so numerous as to be within the reach of any young man of ability, range from £60 to £80 a year, with rooms free, which would go a considerable way toward defraying the expense of a university education. At the close of this education come the fellowships; and it has been calculated that when the arrangements of the commissioners are complete, there will be between 20 and 30 fellowships, mostly about £300 per annum, open yearly to competition.

Oxford is, of course, chiefly fed from the great English schools. A close connection subsists, by the terms of the foundation, between Winchester and New College, between Westminster and Christ Church, and between Merchant Taylors' and St. John's. For the nature of this connection, see under these colleges. A student desirous of going to Oxford, must apply to the head of the college to which he wishes to belong. Application in former times had to be made early, as all the good colleges were filled up for several years in advance. But now that undergraduates are allowed by most colleges to live in lodgings from the first, a candidate can have no difficulty in securing admission even to a distinguished college at short notice. There is no *university* examination at matriculation; but all the good colleges have such an examination before they receive any one—the standard of the examination, of course, varying with the college. After being received into the college, the undergraduate is sometimes assigned to a college tutor, who exercises a special control over his reading; but he also attends the instruction of the other college tutors or lecturers, as the course of his studies may require. The cost of tuition varies at different colleges, but an average of £65 may be given as paid by the undergraduate during his whole career. This payment is at some colleges distributed over three, at others over four years. Besides this, almost every undergraduate finds it necessary, at some period before taking his degree, to read with a private tutor, whom he chooses for himself. Private tuition has grown to be quite an institution in Oxford, though not formally recognized. Many of the ablest young men, after taking their degree, remain in Oxford for a year or two, taking private pupils. In this way an undergraduate, even of a badly-taught college, could secure the advantages of the best tuition. But during the last few years, the lecturers in different colleges have more and more combined and systematized their work; and thus to a slight extent obviated the need of private tuition. Much discussion has taken place on the merits and faults of this system; but, on the whole, it must be allowed to be useful for the tutor, as clearing up and concentrating his knowledge, while, at least to undergraduates who read for honors (with a few rare exceptions), it may be considered as absolutely necessary. Private tutors usually charge £10 a term for three hours a week. Previous to 1852, the professoriate of Oxford was strictly ornamental. A great effort was then made to stir

it into life, which has been partially successful. New professorships were created, and the endowments of old ones were increased by the commissioners, under 17 and 18 Vict. c. 81. But the former of these measures, at least, whatever it may have done for the interests of science, has produced but little effect on the undergraduates. They still limit their range of studies by the requirements of the examinations of the schools, and it were hard to expect them to do otherwise. But professorial teaching has undoubtedly become more popular in the ordinary branches of study. Lectures by the professors of law and modern history, of moral philosophy, logic, Greek, and Latin, are felt to be useful, and are therefore well attended. With regard to the expenses of Oxford, it is difficult to say anything very definite. They vary at different colleges, not only indirectly from the tone of the society, but even directly from the charges made for necessaries. A man should be exceedingly comfortable at Oxford with £200 a year; on £150, he can manage with economy. Many young men could not with prudence, be exposed to the difficulties of living in Oxford on less than the latter sum. There have indeed been instances of men passing creditably through the university course on £100 a year. The *necessary* expenses do not exceed that sum; the habits of the young men themselves cause a great part of the expenses. Returns procured by the delegates for unattached students show that some students cover their board, lodging, and tuition for about £45 a year. Discipline inside the college is maintained by the head of the house and the tutors; in the town and its neighborhood, by the proctors, who are university officers with great authority. As a rule, this authority is well exercised. According to the *Universities Commission Report* (1874), the revenue of the colleges and university in 1871 was £413,000.

The following is a list of the colleges and halls as they rank in the university; an account of each will be found in its alphabetical place; University, Balliol, Merton, Exeter, Oriel, Queen's, New College, Lincoln, All-Souls, Magdalen, Brasenose, Corpus Christi, Christ Church, Trinity, St. John's, Jesus, Wadham, Pembroke, Worcester, Keble, Hertford, St. Mary Hall, St. Edmund Hall. To these may be added Charsley's Hall, being a private hall under the mastership of W. H. Charsley, in virtue of a statute passed in 1854, empowering any M.A. of a certain standing to open a private hall on his obtaining a license from the vice-chancellor. The unattached students now number upward of 300. Within recent years, Lady Margaret's, Somerville, and St. Hughes's Halls have been founded for women.

Among the books which may be consulted with regard to Oxford are—Ayliffe's *History of Oxford*, Wood's *Annals*, the *University Calendar*, and above all, the *Report of the Royal Commissioners for* 1852 and the *Student's Handbook to the Univ. of Oxford.*

OX-GALL, the bile of the ox, greenish-yellow in color. It has several uses in arts and manufactures. It is reduced to the form of an extract for preservation, and when used dissolved in alkaline water. The chief use is in mixing colors, the effect being to give them tenacity and fluidity. It is also an ingredient in varnish, and is a substitute for Indian ink, and is used in painting on ivory.

OXIDATION is the term applied to the union of any body with oxygen, the body being then said to be *oxidized*, and the resulting compound being termed an *oxide*. Many bodies possess the property of entering into several distinct combinations with oxygen. For example, manganese, Mn, forms no less than six such compounds—viz., MnO, Mn_2O_3, Mn_3O_4, MnO_2, MnO_3, Mn_2O_7, which represent different stages of oxidation.

OXIDES, METALLIC, are the most important of all the compounds of the metals, and in many cases occur naturally as abundant and valuable ores. They are divided by chemists into three classes—viz., (1) basic oxides or bases, (2) saline or indifferent oxides, and (3) acid oxides or metallic acids. The different oxides of the same metal usually afford illustrations of two, and not unfrequently of all three of these classes. Thus (to take the case of manganese referred to in the last article) the protoxide, MnO, is a powerful base, the red oxide, Mn_3O_4, is a saline or indifferent oxide, showing little tendency to combine either with acids or alkalies, while permanganic acid, Mn_2O_7, presents all the properties of an acid. "As a general rule, the greater the number of atoms of oxygen which an oxide contains, the less is it disposed to unite with the acids; on the contrary, it frequently possesses acid properties, and then unites with bases to form salts. Protoxides generally are strong salifiable bases; they require two equivalents of a monobasic acid to form neutral salts. Sesquioxides are weaker bases; their salts are usually unstable; they require six molecules or equivalents of a monobasic acid to form a salt which is neutral in composition, though it may not be neutral to test-paper; and in general, all oxides require twice as many equivalents of acid as they contain atoms of oxygen in their composition. Some of the metallic acids, like the stannic and titanic, contain two atoms of oxygen to one atom of metal, but most of them contain three atoms of oxygen—such, for example, as the manganic, ferric, chromic, tungstic, molybdic, and vanadic acids; whilst in a few cases, such as the arsenic, antimonic, and permanganic, the proportion of oxygen is still higher."—Miller's *Inorganic Chemistry*, 2d edit. p. 314. Of the basic oxides, which form by far the most important class, it may be observed that they are devoid of all metallic appearance, and present the characters of earthy matters, and that six only of them are soluble in water to any considerable extent—viz., the three alkalies and baryta, strontia, and lime. All the oxides are solid at ordinary

temperatures, and as a general rule, the addition of oxygen to a metal renders it much less fusible and soluble; the protoxide of iron, the sesquioxide of chromium, and molybdic acid being the only oxides that melt more readily than the metal.

OXLEY'A, a genus of trees of the natural order *cedrelaceæ*, of which one species, *O. xanthoxyla*, the YELLOW WOOD of Eastern Australia, is a very large tree, 100 feet high, valuable for its timber.

OXLIP. See PRIMROSE.

OXPECKER. See BEEF-EATER.

OX'US, the ancient name of a great river in Central Asia, which is called by the Turks and Persians JIHÛN, and AMÛ or AMÛ-DARIA by the natives of the country through which it flows. The Oxus rises in lake Sari-kol, in the elevated plateau which separates Eastern and Western Turkestan. It flows through Buddakshan, Bokhara, and Khiva, and empties itself by several mouths into the sea of Aral. In the first part of its course its volume is increased by numerous affluents, but it receives no tributaries after entering Khiva, from which point its course is wholly through a dry sandy desert. Its total length is about 1150 miles. The value of the Oxus for the purpose of water communication, is said by recent Russian geographers to have been much overrated in Europe; and they add that, in summer, vessels of even slight draught could only be got upon the stream by shutting off the irrigation canals, and risking the desolation of the country dependent on them for its crops. The true value of the Oxus lies in the means it will supply of irrigating the sterile alluvial wastes through which it runs. Before the Christian era, it is believed that the Oxus flowed into the Caspian, and that since 600 A.D. it has twice changed its course (see ARAL). A great part of the old bed of the Oxus has recently been explored by M. Stebnutzki (*Bulletin de la Soc. de Géogr. de Paris*, April, 1871), who has ascertained that it has a fall towards the Caspian, from which he infers that its course was not changed by an upheaval of the Turcoman desert, but by the simple accidents of fluvial action on an alluvial soil. In his address to the London geographical society in May, 1872, sir Henry Rawlinson said the restoration of the Oxus to its old bed was then under the serious consideration of the Russian government, that it was a work of no engineering difficulty whatever, and would assuredly be accomplished as soon as the neutrality of Khiva was secured.—See *A Journey to the Source of the Oxus*, by John Wood, with Essay of the Geography of the Oxus Valley by col. Yale, 1873; also *The Road to Merv*, by sir H. Rawlinson, in the proceedings of the geog. society, 1879; and a *Monograph on the Oxus, in Jour. Roy. Geog. Soc., XLII.*

OXYA'CIDS. When Lavoisier, in 1789, gave the name of oxygen to the *dephlogisticated air* discovered, in 1774, by Priestley, he believed that the presence of that body was essential to the existence of an acid, and this view was supported by the composition of the principal acids which were then known, such as sulphuric, nitric, carbonic, and phosphoric acids. But, by degrees, acids were discovered into which no oxygen entered, but which always contained hydrogen, and hence acids were divided into two great classes, the *oxyacids* and the *hydracids;* oxygen being supposed to be the acidifying principle in the former, and hydrogen in the latter. At the present day scientific chemists usually restrict the term *acid* to compounds into which hydrogen enters, and the acids are regarded as salts of the last-named element; thus, sulphuric acid, H_2SO_4, and nitric acid, HNO_3, are the sulphate and nitrate of hydrogen; hydrochloric acid, HCl, is chloride of hydrogen, etc.

OXYCHLO'RIDES, chemical compounds containing both chlorine and oxygen in combination with some other element or radical. Chloride of lime, $Ca(ClO)_2$, chloride of potash (KOCl), oxychloride of lead or Turner's yellow belong to this class.

OXYGEN (symb. O, equiv. 8; new system, 16; sp. gr. 1.1056) is a colorless, inodorous, tasteless gas, long regarded as a "permanent" gas, but liquefied by Pictet of Geneva for the first time in 1877. Its chemical affinities for other elementary substances are very powerful; with most of them it is found in combination, or may be made to combine, in more than one proportion; with several in 4, 5, or 6 proportions; and there is only one element (fluorine) with which it does not enter into any combination. Owing to the intensity with which many of these combinations take place, this gas has the power of supporting combustion (q.v.) in an eminent degree. Of all known substances, it exerts the smallest refracting power on the rays of light. It possesses weak but decided magnetic properties, like those of iron, and like this substance, its susceptibility to magnetization is diminished or even suspended by a certain elevation of temperature. It is only slightly soluble in water; 100 cubic inches of that liquid dissolving 4.11 cubic inches of gas at 32° F. (0° C.).

Oxygen gas is not only respirable, but is essential to the support of animal life; and hence it was termed *vital air* by some of the older chemists. A small animal placed in a bell-glass containing pure oxygen will not be suffocated so soon as if it were placed in the same glass filled with atmospheric air. For further details on this property of oxygen, the reader is referred to the article RESPIRATION.

Oxygen is the most abundant and the most widely distributed of all the elements. In its free state (*mixed* but not *combined* with nitrogen), it constitutes about a fifth of the bulk, and considerably more than a fifth of the weight, of the atmosphere. In combina-

tion with hydrogen, it forms eight-ninths of all the water on the globe; and in combination with silicon, calcium, aluminium, etc., it enters largely into all the solid constituents of the earth's crust; silica in its various forms of sand, common quartz, flint, etc.—chalk, limestone, and marble—and all the varieties of clay, containing about half their weight of oxygen. It is, moreover, found in the tissues and fluids of all forms of animal and vegetable life, none of which can support existence independently of this element.

There are various modes of obtaining oxygen, the simplest of which consists in the exposure of certain metallic oxides to a high temperature. It was originally obtained by its discoverer, Dr. Priestley, from the red oxide of mercury, which, when heated to about 752° F. (400° C.), resolves itself into metallic mercury and oxygen gas. It may be similarly obtained from red oxide and peroxide of lead, the resulting products in these cases being protoxide of lead and oxygen. The following are the chief methods now employed: (1.) The black oxide (or dioxide) of manganese, MnO_2, is much employed as a source of this gas. The mineral is reduced to small pieces of about the size of a pea, and introduced into an iron bottle, with a pipe through which the gas may escape. When the bottle is placed in a furnace, and attains a red heat, the mineral parts with one-third of its oxygen, and the red oxide of manganese, MnO,Mn_2O_3, remains behind; the reaction being explained by the equation:

Black oxide of Manganese.		Red oxide of Manganese.		Oxygen.
$3MnO_2$	=	MnO,Mn_2O_3	+	$2O$

(2.) A very pure and abundant supply of oxygen may be obtained by heating potassium chlorate, $KClO_3$, which yields up all its oxygen (amounting to 39.16 per cent.), and leaves a residue of chloride of potassium. One ounce of this salt yields nearly two gallons of oxygen gas. It is found by experiment, that if the chlorate of potash is mixed with about a fourth of its weight of black oxide of copper, or of manganese dioxide, the evolution of the gas is greatly facilitated, although the oxides do not seem to undergo any change during the process. (3.) Oxygen is readily obtained by heating strong sulphuric acid with about half its weight of powdered black oxide of manganese or potassium bichromate, in a glass retort; the reaction in the former case being expressed by the equation:

Black oxide of Manganese.		Sulphuric acid.		Sulphate of Manganese.		Water.		Oxygen.
MnO_2	+	H_2SO_4	=	$MnSO_4$	+	H_2O	+	O

and in the latter case, being of a more complicated character. (4.) Various processes have been proposed for obtaining the gas on a large scale, of which the following, recommended by St. Claire Deville and Debray, is perhaps the best: The vapor of hydrated sulphuric acid is passed over red-hot platinum, by which it is decomposed into oxygen and sulphurous acid, the latter of which may easily be separated (and made available for the formation of sulphites) by its solubility in water or alkaline solutions. It has been calculated that a cubic meter (35.375 cubic ft.) of oxygen costs about $2 when obtained from chlorate of potash; nearly $1 when obtained from manganese; and only 20 cents when obtained from sulphuric acid. The easiest method of obtaining oxygen is by passing a current of electricity through acidulated water. Oxygen is liberated at the anode or positive pole.

Oxygen was discovered almost simultaneously, in the year 1774, by Priestley and by Scheele, the English chemist having the precedence by a few weeks. Priestley gave it the name of *dephlogisticated air;* Scheele termed it *empyreal air;* Condorcet shortly afterward suggested *vital air*, as its most appropriate designation; and in 1789, Lavoisier, who, by a series of carefully conducted and very ingenious experiments, proved that the combustion of bodies in the air consisted essentially in their chemical combination with oxygen, and thus overthrew the *phlogiston* (q.v.) theory, gave it the name which it now retains, in consequence of his (erroneously) believing that it possessed a certain property which is described in the article Oxyacids.

OXYGEN, in medicine. Ever since the discovery of oxygen, its use in medicine has been attempted, principally with the idea that it would be an invigorating purifier of the blood. It has been used in consumption; in diabetes for assisting in the consumption of sugar in the blood; and in hydrophobia; and although the use has been claimed to be sometimes beneficial, this cannot be said of most cases. Indeed, it has been pointed out by Drs. A. H. Smith and B. W. Richardson that, as a general rule, only a certain proportion of oxygen, such as exists in the atmosphere, can be absorbed by the lungs. Their opinions have been supported by the experiments of Bucheim, who concludes "that henceforth we must abandon the notion that the course of diseases can be modified by increasing the amount of oxygen in the blood." It is believed, however, that in some cases of chronic bronchitis, and other pulmonary affections attended with symptoms of asphyxia, the inhalation of oxygen has prolonged life. In some cases of laryngitis in which the opening of the glottis has been very much reduced, the inhalation of oxygen has been the means of saving life. Cases of poisoning by charcoal fumes have been successfully treated. It should be administered in the same manner as laughing gas.

OXYHYDROGEN BLOW-PIPE, an instrument for the purpose of burning oxygen and hydrogen gases in their equivalent proportions, so as to get the greatest heat from the combination. Two volumes of hydrogen and one of oxygen form an exceedingly powerful explosive mixture, in consequence of their instantaneous union upon the application of sufficient heat, as the electric spark or a taper, the result being the formation of water. It was, therefore, early known to be dangerous to experiment with the mixed gases. In some instances, when the gases were contained in separate reservoirs and connected by tubes at their extremities, they have become mingled in one of the reservoirs in consequence of a backward flow of the mixture, and serious accidents have resulted. This led to the early use of concentric tubes for the delivery of the gases, the hydrogen tip usually surrounding the one discharging the oxygen. By properly regulating the pressure in the gas-holders the two gases may be mingled without danger, near the end of the tubes, at the entrance of the burner. Hemming's safety jet is used for burning the gases mixed in the same reservoir; but it is not thought safe to have this of metal, but of a membrane. The ordinary burner, which mingles the two gases for some inches before their exit, is all that is sufficient to produce thorough admixture previous to ignition, and will furnish as "solid" a flame as may be desired. The chief uses of the oxyhydrogen blow-pipe are to fuse metals, and to render lime incandescent in the calcium light.

OXYHY'DROGEN MICROSCOPE. See SOLAR MICROSCOPE.

OXYRHYN'CHUS, the name of a celebrated Egyptian fish, said to be reverenced throughout Egypt, and sacred to the goddess Athor. Its name in Egyptian is *kha*, and the fish in the hieroglyphs was used for this syllable, and particularly expressed the idea of the body. In the ritual, the deceased particularly stated that he had not caught this fish. The name appears to have comprised the genus *mormorus*, distinguished by its pointed nose and long dorsal fin. The fish was worshiped in one of the nomes, which was called after it, and the inhabitants held it in such reverence that they would not touch any fish captured by a hook. When the portions of the body of Osiris were flung into the Nile, this fish alone ate one portion of his body. The oxyrhynchus was not eaten in Egypt, except by the natives of the Cynonopolites Nomos. Its modern name is *mizeleh*, which seems retained in the Coptic Pemge, the name of the city of Oxyrhynchus. It is represented both in the sculptures and on the coins of the nome, and was anciently embalmed.—The city of Oxyrhynchus is the modern Behneseh, lying on the w. bank of the Nile, in lower Egypt, near the Bahr-el-Jusuf.

OXYU'RIS VERMIC'ULARIS is the name now assigned by most zoologists to the intestinal worm described as *ascaris* (q.v.) *vermicularis*, yet it is the original and true ascaris. For the mode of recognizing the presence of this worm, and treating patients suffering from its presence, the reader is referred to the articles VERMIFUGES and WORMS.

O'YER (law French, a hearing, from Lat. *audire*, to hear). When a party to an action supports his claim or defense by a deed, he is obliged to make profert of the deed, i.e., make averment in his plea that he produces in court the deed alleged. The other party may then demand oyer of the deed, i.e., hear it read. Under the old system of oral pleadings, the deed was actually brought into court and read by the party pleading it upon demand by the other party. Under the system of written pleadings the deed is not actually brought into court, unless the other party serves a written notice that he demands oyer. The party pleading the deed must then allow his opponent to see the deed, or give him a copy. The formula for making profert was as follows: "One part of which said indenture, etc., sealed with the seal of the said plaintiff [or defendant], the said plaintiff [or defendant] now brings into court." The object of oyer is to spread the deed upon the record, and give the opposite party an opportunity of knowing its contents, and availing of them in pleadings. Under the common-law rules of pleading, the party setting forth a deed need not allege the whole of it, but only such parts as were material to his defense or claim. It was often of great importance to the opposite party to have oyer of an instrument whose terms he might be unable to learn in any other way. If a party whose duty it is to make profert cannot bring in the deed, he must excuse his failure to do so in his plea; but he must not make profert, for, if he do, oyer may be demanded and judgment given against the party failing to make oyer. Oyer could be granted only where profert was necessary; and if profert were unnecessarily made, or not made when necessary, oyer would not be granted. Oyer is not necessary except in the case of instruments under seal; though an executor or administrator, instituting a suit, must make profert of his letters testamentary or of administration. Oyer was abolished in England in 1852, and the production of instruments is obtained in most of the American states in other ways, as by an order of a judge to a party calling upon him to allow the opposite party to inspect the instrument, etc.

O'YER AND TER'MINER (Fr. *ouïr*, to hear; *terminer*, to determine). A commission of oyer and terminer is granted in England to the judges and others to hear and determine all treasons, felonies, and trespasses; and it is by virtue of this commission that the judges on circuit dispose of criminal cases in the various circuits. Sometimes a special commission of the same kind is issued, authorizing the judges to go and try prisoners at other than the ordinary times.

The term oyer and terminer is applied in England to courts trying criminal causes by special commission; but, in this country, courts with that name try criminal causes by authority of statute. In New York the court of oyer and terminer is the highest criminal court of original jurisdiction. In Pennsylvania it is also a court of criminal jurisdiction, held generally by the same judges as the court of quarter sessions.

OYEZ! (Fr. *ouïr*, "to hear") is an expression signifying "hear ye," introduced into courts of justice in England by the Normans (q.v.). It is now used generally by criers of courts, being repeated three times, for the purpose of securing silence and attracting attention before making a proclamation. It is commonly, but incorrectly pronounced "Oh yes!"

OYSTER, *Ostrea*, a genus of lamellibranchiate mollusks, of the section with a single adductor muscle. See LAMELLIBRANCHIATA. The shell consists of two unequal and somewhat irregularly shaped valves, of laminated and coarsely foliated structure; and the hinge is without tooth or ridge, the valves being held together by a ligament lodged in a little cavity in each. The animal is, in its organization, among the lowest and simplest of lamellibranchiate mollusks. It has no *foot;* and, except when very young, no power of locomotion, or organ of any kind adapted to that purpose. Its food consists of animalcules, and also of minute vegetable particles, brought to it by the water, a continual current of which is directed toward the mouth by the action of the gills. The gills are seen in four rows when the valves of the shell are separated, a little within the fringed edge of the mantle. In the most central part is the adductor muscle; toward the hinge is the liver, which is large; and between the adductor muscle and the liver is the heart, which may be recognized by the brown color of its auricle. The mouth—for, as in the other lamellibranchiata, there is no head—is situated beneath a kind of hood, formed by the union of the two edges of the mantle near the hinge. It is jawless and toothless. The ovaries are very large during the season of reproduction, which extends over certain months in summer, when oysters are out of season for the table. Oysters are hermaphrodite. They produce vast numbers of young. Leeuwenhoek calculated that from 3,000 to 4,000 exist within an oyster at once when "sick," "milky," or full of spawn; and, according to Poli, one oyster produces about 1,200,000 eggs. The eggs are hatched within the shell and mantle of the parent, and the young are to be seen swimming slowly in a whitish and mucous or creamy fluid surrounding the gills, which becomes darker and of a muddy appearance when they are about to be expelled. Each young oyster is then about $\frac{1}{120}$ of an inch in length, and about two millions are capable of being closely packed in the space of a cubic inch. When the parent oyster expels the young, and this is done simultaneously by multitudes on an oyster-bank, the water becomes filled as with a thick cloud, and the spawn—called *spat* by fishermen—is wafted away by currents; the greater part, of course, to be generally lost, by being driven to unsuitable situations, as exposed rocks, muddy ground, or sand to which it cannot adhere, or to be devoured by fishes and other marine animals, but some to find an object to which it can attach itself for life. The young come forth furnished with a temporary organ for swimming, ciliated, and provided with powerful muscles for extending it beyond the valves and withdrawing it at pleasure; and when the oyster has become fixed in its permanent place of abode, this organ, being no longer of any use, has been supposed to drop off, or gradually to dwindle away and disappear. But Dr. F. Buckland has recently expressed the opinion that the swimming organ of the young oyster is the "lungs," and remains as the "lungs" in the mature oyster. In very favorable situations, oysters grow rapidly, so that the common oyster is ready for the table in a year and a half or two years; but in other places, a longer time is required, often about five years.

The species of oyster are numerous, and are found in the seas of all warm and temperate climates. None have been found in the coldest parts of the world. The COMMON OYSTER (*O. edulis*) is the only British species. Like it, the other species are generally found where the water is of no great depth; and some of them, also like it, are very abundant in estuaries, where the water is not very salt. The mangrove swamps of warm climates often abound in oysters of excellent flavor (*O. parasitica*, etc.), adhering to the roots and branches of the trees, within the reach of the tide. Some of the species differ from the common oyster not a little in form, as the LONG-HINGED OYSTER (*O. Canadensis*) of North America, which is very elongated; and some of them far exceed it in size. Sir J. E. Tennent states that he measured the shell of an edible oyster in Ceylon, and found it a little more than 11 in. in length by half as many in breadth; "thus unexpectedly attesting the correctness of one of the stories related by the historians of Alexander's expedition, that in India they had found oysters a foot long."

Young oysters readily attach themselves to the shells of old ones, and thus, in favorable circumstances, oyster-banks increase rapidly, so as to fill up shallow parts of the sea, and to form walls which effectually resist the waves and tide. This is very remarkably the case on the alluvial shores of Georgia and some other parts of North America, where these banks are called *Racoon Banks*, because the racoon, among other animals, visits them to feed upon the oysters. Marshy land extends inwards from 12 to 18 m. from the sea, with tidal rivers meandering through it, and these rivers are kept pretty constant to their channels by the walls of living oysters on both sides. Large bunches of oysters may even be found among the long grass. It is not unusual for the inhabitants of the neighborhood to light a fire and roast a bunch of oysters on the spot. So abundant are the oysters in many places that a vessel of 100 tons might be loaded within three times

her own length. American oysters, which are of excellent flavor, are an important article of commerce in America, and have begun to be imported (alive) into Britain.

Notwithstanding the prodigious fecundity of the oyster, however, the beds or banks which yield it for the markets of Britain and other European countries are not sufficiently productive to satisfy the demand, and it is not so much an article of ordinary food for all classes as a luxury of the wealthy. The usual mode of taking oysters by dredging is destructive, although, for oyster-beds, which are at all states of the tide covered with a considerable depth of water, nothing better has been devised, and the anxiety of fishermen to make the most of the present opportunity has caused many beds to be almost ruined by over-dredging. But the artificial formation of oyster-beds has been resorted to with great promise of success. It is indeed no novelty, having been practiced by the Romans. Pliny says that "the first person who formed artificial oyster-beds was Sergius Orata, who established them at Baiæ. . . . . This was done by him, not for the gratification of gluttony, but for the sake of gain, as he contrived to make a large income by the exercise of his ingenuity." Sergius Orata lived in the time of Augustus. Among the *vivaria* of later emperors and other wealthy Romans were *ostrearia*, specially devoted to oysters; and oyster-culture has never ceased to be practiced in Italy, although to an inconsiderable extent, and particularly in lake Fusaro, the Acheron of Virgil, a muddy salt-water pond, nowhere more than two yards deep. In Britain it has also long been practiced to some extent, particularly on the coasts of Kent and Essex, for the supply of the London market.

In 1864 an act of parliament was passed giving exclusive rights to a company, called the "Herne bay, Hampton, and Reculver oyster fishing company," over a certain portion of the shore at Herne bay, extending about 6 m. in length by 1½ in breadth. The oyster-beds fished by the public had, till then, yielded a very small supply; and it was urged that this supply could be largely increased by a well-managed company. In order that the public should not be injured by this legislation it was declared by one of the clauses of the act that "if the company fail to maintain and cultivate the beds, or to produce well-fed oysters fit for the public market in such quantities as to be of public advantage, all the privileges conferred on the company would be withdrawn, and the dredging of the beds, as formerly, thrown open to the public to fish."

In 1869 the board of trade commissioned Mr. Pinwell, inspector of oyster fisheries, to visit the oyster-culture grounds of France, in order to ascertain whether we could gather any useful hints therefrom. In his report he explained that the English plan, as conducted at Herne bay, Reculver, Whitstable, Langston harbor, the Isle of Wight, and other localities, depends on the provision of salt-water tanks or ponds, in which the oysters are kept for a certain time. In France the system is much more elaborate. He found that the coast is parted off into divisions or districts, each of which is placed under a maritime prefect. Each district is divided and subdivided into smaller portions, managed by commissioners, inspectors, syndics, and watchmen. The determination of "close-time," when oyster-fishing is totally prohibited, the decision how much to fish up, and how much to reserve for restocking; the discrimination between public oyster-beds and those which are made over to individuals by "concessions;" the control of the fore-shore; the maintenance of oyster-breeding farms; the prevention of poaching by fishers not belonging to the respective districts—occupy quite an army of officials. Mr. Pinwell recommended the adoption of some matters of detail from the French system, but not an imitation of the elaborate official machinery.

In 1872 the enhanced price of oysters in France attracted much public attention. Close observers arrived at an opinion that it was due to three causes—the impoverishment of some of the beds by injudicious dredging; a greatly increased demand for the supply of Germany and Russia; and a private understanding between many of the French companies, leading to something very like a monopoly.

Oysters live equally well in situations where they are constantly under water, and in those which are left dry by the retiring tide. In the latter kind of situations they instinctively keep their valves closed when the water deserts them. It is in such situations that oyster-culture can be most easily and profitably carried on. Our space will not admit of details, which we would gladly give. Various methods are adopted of preparing the artificial oyster-bed by providing suitable solid objects for the oysters to attach themselves to. Stones are piled together, and in such a way that there are many open spaces among them; stakes are driven into the mud or sand; bundles of small sticks are fastened to stones or stakes; floors of planks are formed, at a little height above the bottom, with alleys between them, the under surface of the planks being roughened by the adze; and tiles are arranged in various ways, so as to turn to account the whole space at the disposal of the oyster-cultivator as high as the ordinary tides reach. The method must be varied in accordance with the situation and the probable violence of winds and waves; but sheltered situations are best in all respects; and experience in France seems to prove that tiles covered with cement are preferable to everything that has yet been tried, as convenient for the cultivator, presenting a surface to which oysters readily attach themselves, and from which they can easily be removed, whilst the larger sea-weeds do not grow on it so readily as on stones or wood. By the use of tiles covered with cement the cultivator is also able easily to remove young oysters from breeding-grounds

to feeding-grounds; the best breeding-grounds being by no means those in which the oyster most rapidly attains its greatest size and that greenish tinge which Parisfan epicures so much desire to see, and which is owing to the abundant confervæ and green monads of quiet muddy waters.—It has been long known that the oysters of particular localities are finer than those produced elsewhere. Nowhere, perhaps, are finer oysters produced than on some parts of the British coasts. Those of Rutupiceæ, now Richborough, in Kent, were highly esteemed by the Romans, whose epicurism in oysters exceeded that of modern nations.

Of the culinary uses of oysters it is unnecessary to say anything. Raw oysters, however, are generally believed to be more nutritious and more easily digested, as to many they are more delicious, than oysters cooked in any way; and it does not appear that any such evil consequences ever ensue from eating them as are known to ensue from eating other kinds of uncooked food. Probably no parasite capable of developing into any form injurious to the human being exists in the oyster.

The genus *ostrea* gives its name in some zoological systems to a family—*ostreadæ*. The fossil species are more numerous than the recent.

The name oyster is popularly extended to many mollusks not included among the *ostreadæ*, as the pearl-oyster (q.v.).

Oysters raised in artificial beds are called "natives," and are considered very superior to those which are dredged from the natural beds; although to these last the name of "native" would seem more appropriate than to the other. Some years ago it was estimated that 500,000,000 oysters were consumed annually in London alone, at a cost of £100,000; but the supply has since lessened, and the price per 100 greatly increased.

The oyster in America is found from Maine to Mexico on the Atlantic and gulf coast, and from Puget sound to Mexico on the Pacific. The *ostrea borealis* and *Virginica* are the varieties of the e., and the *ostrea conchofila* and *lurida* of the w. coast. The American oyster does not hatch its eggs in its shell, but the spawn of the male and female mingles in the water, where fertilization takes place, and the young oyster is produced. Long Island sound, the New Jersey coast, Delaware and Chesapeake bays, are the localities from which, mostly, oysters are obtained. The spawning season lasts from April to October. They begin to spawn when about a year old. Large numbers are taken from Chesapeake bay to northern waters to be replanted; they are also sent to the Pacific coast for the same purpose, the early spring being the best season. The star-fish, borer, and winkle destroy many of them; also ice and storms are injurious. Much attention is now paid to their cultivation on account of the growing scarcity. Many breeds, especially in Chesapeake bay, have been almost destroyed by dredging. The census of 1880 put the capital employed at $10,500,000, and the value of the shore property at $5,500,000.

Fossil Oysters.—A single species occurs in the carboniferous limestone, and as we rise in the crust of the earth the genus becomes more and more common, no less than 200 species have been recorded, many of them scarcely distinguishable from the living species. The subgenus gryphæa was a free shell, with a large thick left valve and small concave right valve. Thirty species have been found in beds of the oolite and chalk periods. In the same beds there occurs another form of ostrea with subspiral reversed umbones, to which the subgeneric name exogyra has been given. Forty species of this form have been described. See Philpot, *Oysters and all about them* (1890).

OYSTER BAY, a town and watering-place on the n. coast of Long Island, N. Y., on a deep sheltered bay, opening into Long Island sound; 34 m. n.e. of New York city. It abounds in handsome residences and fine scenery, and offers facilities for fishing, bathing, etc. Pop. '90, 13,870. It contains several churches; steamboats run to New York

OYSTER-CATCHER, *Hæmatopus*, a genus of birds of the family *charadriadæ* (q.v.), chiefly inhabiting sea-coasts, where they feed on mollusks, crustaceans, annelids, and other marine animals—sometimes even on small fishes. Their legs are of moderate length, like those of the plovers, and, like them, they have no hind-toe. The most remarkable generic distinction is found in the bill, which is long, strong, straight, much compressed and wedge-like towards the point. They are generally said to make use of the bill for opening the shells of oysters and other mollusks; but the late Mr. James Wilson expresses a very reasonable doubt on this point. The habits of the British species (*H. ostralegus*), so far as they have been accurately observed, agree with those of the American. It is the only European species, and is common on all parts of the British coasts, on those of continental Europe, the n. of Africa, and of the n. of Asia. Its whole length is about 16 inches. Its finely contrasted black and white colors have gained it the name of Sea Pie. It is most abundant on the sea-coast, but often visits inland regions, and sometimes breeds in them. It does not make a nest, but lays its eggs —usually four—on the shingly beach or bare ground. On some of the sandy flat coasts of Lincolnshire the oyster-catcher is so abundant that a bushel of the eggs have been collected in a morning by a single fisherman. The American oyster-catcher is a bird of passage, deserting the northern regions in winter. It is rather larger than the European species, and differs from it in colors, and in greater length and slenderness of bill. See illus., Ostrich, etc., vol. XI.

OYSTER GREEN, marine algæ of the genus *ulva,* sometimes called sea-lettuce. The ulvas are chlorospermous sea-weeds, having green spores and generally green fronds. The most abundant on the shores of the United States are *U. latissima* and *U. lactuca,* common on oyster beds, being also used by oystermen to cover heaps of oysters. The leaf is from 3 to 12 in. wide, and from 4 to 24 in. long. It is the most valuable of the sea-weeds for a salt-water aquarium, because of its ability to thrive in still water. The sea-lettuce is often eaten in Europe as "greens," under the impression that it is a good blood purifier and antiscorbutic, and it probably has medicinal properties.

OYSTER-PLANT. See SALSIFY.

OYSTERS, LAW AS TO. The rule is that he who has the right of property in the soil or sea-shore is entitled to catch or keep and breed oysters there. But the shore below the medium line of the tides belongs to the crown, and not to any individual; and it is only by virtue of some grant from the crown that an individual or a corporation can establish an exclusive title to the sea-shore, and in such a case is exclusively entitled to any oyster-beds there. It is thus always by virtue of a grant from the crown that oyster-fisheries are claimed as the property of an individual or of a corporation. The act 31 and 32 Vict. c. 45, however, now enables the board of trade to grant parts of the sea-shore of Great Britain to individuals for breeding oysters and mussels, and has given new remedies for the protection of this property. The general law is as follows: Whoever steals oysters or oyster-brood from an oyster-bed which is private property is guilty of felony; and whoever unlawfully or willfully uses any dredge net or instrument within the limits of a private oyster-bed, for the purpose of taking oysters, though none are actually taken, is guilty of a misdemeanor, and is liable to be imprisoned for three months. But persons are not prevented from fishing for floating fish within the limits of an oyster-fishery, if they use nets adapted for floating fish. Certain statutes as old as the time of Richard II. were passed to protect oyster-brood, but these were recently repealed by the sea fisheries act, 1868 (Paterson's *Fishery Laws of the United Kingdom*). The rule as to the exclusive ownership of shell-fish above the water-line of the owner of the sea-shore is the same in the U. S. as in England. It has also been decided that the state legislatures have the power to pass laws restricting the taking of oysters below low-water mark along the shores of their respective states. And such a restriction, which discriminates against the inhabitants of other states, is not unconstitutional. So too in several states there are provisions of law by means of which any person may acquire an interest in a certain number of acres of land under water for the purpose of planting and maintaining there an oyster bed for the propagation of oysters. If the requirements of the statute relative to staking, giving notice, etc., are complied with, the planter has the exclusive use of that part of the land under water staked out by him. Any person who, in disregard of his right, takes oysters from such a bed is guilty of larceny.

OZA'KA. See OSAKA.

OZAN, a township of Hempstead co., Ark. Pop. '90, 4318.

OZANAM, ANTOINE FRÉDÉRIC, 1813–53. At 18 Ozanam was a student of law in Paris, where his religious mind drew him into close relations with the eminent men of the Catholic church, and with Montalembert and Lacordaire. In 1833, with seven other students, he aided to found the society of St. Vincent de Paul, which grew with great rapidity. In 1836 he delivered a memorable essay on Catholic philosophy in the time of Dante; in 1839–40 was professor of commercial law at Lyons; and in 1841 became professor of foreign literature at Sorbonne. On the accession of pope Pius IX., in 1846, he hailed with joy the marriage of liberalism with Catholicism. After the revolution of 1848, studied mediæval history to the ruin of his health, and has left erudite contributions to the history of the time of Dante and the influence of that poet: *Dante et la Philosophie Catholique au XIII. Siècle* and *Études Germaniques pour Servir à l'Histoire des Francs,* are notable among the long list of his works, mostly religious.

OZARK', a co. in s. Missouri, bordering on Arkansas; drained by branches of White river; 780 sq.m.; pop. '90, 97,095, chiefly of American birth, with colored. The surface is broken and in great part covered with forests of pine and other trees, but there is fertile soil in the valleys; the staples are Indian corn, tobacco, and wheat. Sheep breeding is carried on to some extent. Co. seat, Gainesville.

OZARK MOUNTAINS, a range of mountains running from the Missouri river, in Missouri, between the Osage and Gasconade rivers, s.w. through n.w. Arkansas and the Indian territory, to the Red river. They are a succession of hills, not over 2000 feet in height. The Black Hills and Washita range in Arkansas are offshoots of this range.

OZAU'KEE, a co. in s.e. Wisconsin, bordering on Lake Michigan; drained by Milwaukee river and its branches, and intersected by the Chicago and Northwestern railroad; 232 sq. m.; pop. '90, 14,943, chiefly of American birth. The surface is undulating, and there are extensive forests. The staples are oats, wheat, barley, corn, potatoes, rye, wool, and hay. The amount of butter produced annually is more than 500,000 lbs. Machinery and woolen goods are manufactured, and there are flour mills and breweries. Co. seat, Port Washington.

OZE'NA (from the Gr. *ozo*, I smell) signifies a discharge of fœtid, purulent, or sanious matter from the nostrils. It is a symptom rather than a disease, and may arise from ulceration of the membrane lining the nostrils, or from caries of the adjacent bones, and may accompany syphilitic, scorbutic, scrofulous, or cancerous affections of these or adjacent parts. A slighter form of ozena sometimes follows chronic coryza or (cold in the head), malignant scarlatina, and erysipelas of the face. The discharge is seldom accompanied by acute pain, unless when caused by cancer; sometimes, however, an aching is complained of. The prognosis must depend upon the nature of the disease, of which the discharge is a symptom. The treatment may be divided into the general or constitutional, and the local. The *general treatment* should consist of tonics combined with alteratives, as the preparations of bark with the alkalies, or with the mineral acids; a dry, bracing air, or a temporary removal to the sea-side, is also usually of service. If the discharge arises from syphilis or scurvy, the treatment suitable to those diseases should be prescribed. The *local treatment* consists in the inhalation, once or twice a day, of the steam of boiling water, to which a little creosote or carbolic acid has been added; and in more severe cases, in the thorough syringing of the nostrils, so as to wash away all collections of matter with a copious stream of warm water, to which a little chloride of zinc has been added (about 30 minims of Burnett's solution to a half a pint of water).

OZIE'RI, a t. of the island of Sardinia, in the province of Sassari, 25 m. e.s.e. from Sassari, amongst the mountains which occupy the center of the island. It stands in a deep valley, open only to the n., and is therefore peculiarly exposed to cold winds. Pop. about 8600.

O'ZONE (Gr. *ozo*, I smell). It was remarked long ago that a peculiar odor was produced by the working of an electrical machine. Van-Marum found that, when electric sparks were passed through a tube containing oxygen, the gas became powerfully impregnated with this odor—which he therefore called the "smell of electricty." Subsequent writers attributed the phenomenon to the formation of nitric acid due to a trace of nitrogen mixed with the oxygen; especially as the gas was found to act energetically upon mercury. Thus supposed to be explained, these curious results were soon forgotten. But in 1840 Schönbein (q.v.), with remarkable acuteness, made a closer investigation of the question, and arrived at many most curious results, all of which have not even yet been satisfactorily accounted for. The problem remains, in fact, one of the most perplexing, as well as interesting, questions imperfectly resolved in chemistry.

The earlier results of Schönbein were as follows: (1.) When water is decomposed by the voltaic current, the electrodes being of gold or platinum, the oxygen (which appears at the positive pole) possesses in a high degree the smell and the oxidizing power developed by Van-Marum by means of friction-electricity. (2.) When the positive electrode is formed of an oxidizable metal, these results are not observed, but the electrode is rapidly oxidized. (3.) The oxygen collected at a platinum electrode retains these properties for an indefinite period, if kept in a closed vessel; but loses them by heating, by the contact of an oxidizable substance, and even by contact with such bodies as charcoal and oxide of manganese. To the substance, whatever it may be, which possesses such powerful chemical affinities, Schönbein gave the name ozone, from its peculiar smell.

In 1845 he showed that the same substance can be produced by the action of phosphorus on moist air; and suggested that it might be a higher oxide of hydrogen.

De la Rive and Marignac shortly afterwards, repeating the experiments of Van-Marum, showed that electric sparks produce ozone even in *pure* and *dry* oxygen; and came to the conclusion that ozone is oxygen in an *allotropic* state, as diamond is a form of coke or charcoal.

Baumert, in 1853, endeavored to show that there are two kinds of ozone—one formed from pure oxygen by electric sparks, which he allowed to be allotropic oxygen; the other formed in the voltaic decomposition of water, which he endeavored to prove to be a *teroxide* of hydrogen, HO_3. But Andrews, in 1856, completely refuted this view, by showing that no such oxide of hydrogen (at least in a gaseous form) is produced in the electrolysis of water; and that ozone, from whatever source obtained, is the same body; and is not a compound, but an allotropic form of oxygen.

In 1860 Andrews and Tait published the results of a series of *volumetric* experiments on this subject, which led to some remarkable conclusions—among which are the following: When the electric discharge is passed through pure oxygen, it *contracts*. If ozone be oxygen in an allotropic form, it must therefore be denser than oxygen. It was found also that a much greater amount of contraction, and a correspondingly greater quantity of ozone, were produced by a silent discharge of electricity between fine points than by a brilliant series of sparks. The contraction due to the formation of the ozone is entirely removed by the destruction of the ozone by heat; and this process can be repeated indefinitely on the same portion of oxygen.

In attempting to determine the density of ozone, they used various bodies to take up the ozone from the oxygen containing it; and met with many very curious results. Thus, if mercury be introduced, it is immediately attacked and oxidized, and yet the oxygen *increases* in volume. If iodine be employed, it is immediately oxidized, and *no*

change of volume was observed, though the apparatus would have at once rendered visible a change to the amount of $\frac{1}{80000}$th of the bulk of the oxygen. By measuring the contraction produced by electricity in the oxygen, then the effect of introducing a solution of iodide of potassium, and determining the amount of oxygen taken up from the quantity of iodine set free, Andrews and Tait showed that the density of ozone, if it be allotropic oxygen, must be practically *infinite*—i.e., that ozone must have the density of a *liquid* or a *solid* at least, although existing in the gaseous form. This conclusion is, they say, inevitable, unless we make the very improbable assumption, that when iodine, etc., are exposed to ozone, one portion of the ozone (of volume, as oxygen, equal to the the volume of the whole ozone) combines with the iodine, and the other portion is restored to the form of oxygen. The paper from whose statements we have quoted concludes with the suggestion that it is *possible* that, in the formation of ozone, oxygen may be decomposed. This is, of course, contrary to all the received notions of chemistry—but such a supposition would at once reconcile all the apparently contradictory facts connected with this singular body. Soret and Von Babo have recently repeated and verified a few of these results, and the former, by using turpentine as an absorbing substance, and also by measuring its diffusion rate, has endeavored to show that the density of ozone is 50 per cent greater than that of oxygen—a result on the whole consistent with the recent experiments of Brodie. Andrews has lately shown that ozone is rapidly destroyed when shaken up with dry fragments of glass, etc. He has also proved that the effect which is (almost invariably, and sometimes in fine weather powerfully) produced by the air on what are called ozone-test papers—papers which have been impregnated with a solution of starch and potassium iodide and which are rendered brown (or blue) by the liberation of iodine—is really due to ozone. He did so by showing that it acts upon mercury as ozone does, and that it is destroyed by heat at the same temperature. Ozone is now generally considered to be triatomic oxygen, and it possesses much more powerful oxidizing properties than ordinary oxygen.

P

P, THE sixteenth letter of the English alphabet, was in Hebrew called *Pe*, i.e., mouth, most probably from its original form. P is the thin letter of the labial series (*p, b, f, v*), and is interchangeable with the other letters of the series. P, in Sanskrit, Greek, and Latin, is replaced by *f* in the Teutonic tongues. See F. Words *beginning* with *p* in English, and its kindred Teutonic tongues, are almost all of foreign origin (Slavic, Celtic, Latin), as *pain* (Fr. *peine*, Lat. *pœna*), *plough* (Pol. *plug*), *pit* (Lat. *puteus*, a well). The Greek prep. *apo* (Sans. *apa*) became in Lat. *ab;* Gr. *hupo*, Lat. *sub;* Sans. *upa*, Lat. *ob;* but before sharp letters, as *t* and *s*, the original *p* was retained in pronunciation, as is shown by inscriptions (*apstulit, optinui*). There are remarkable interchanges of *p* with the sharp guttural *k* or *q*. Thus, for Lat. *quis, quod, quam*, the Oscan dialect had *pis, pod, pam;* Lat. *equus, coquo*, corresponded to Gr. *hippos* (Æol. *hikkos*), *pepo;* similarly, Gaelic *mac* (son), *ceathair* (Lat. *quatuor*, four), *coig* (Lat. *quinque*, five), correspond to Welsh *map, pedwar* (Gr. *pettores*), *pump* (Gr. *pente* or *pempe*). In Gr. *p* is sometimes replaced by *t*, as *tis, tessares*, for *pis, pettores*. In such words as *redemption, consumption, p* has been introduced as an intermediary between the incompatible sounds *m* and *t*. The initial *p* of Latin words has for the most part passed into French unaltered; in other positions, *p* has become *v;* thus, Fr. *êvêque, cheveux, décevoir, pauvre*, from Lat. *episcopus, capillus, decipere, pauper*.

PA'CA, *Coelogenys*, a genus of rodent quadrupeds, allied to the agoutis, cavies, and capybara, and inhabiting Brazil, Guiana, and some of the West India islands. The dentition very nearly resembles that of the agoutis. The cheek-bones are prodigiously developed, in a way of which no example exists in any other mammalian animal, so that the zygomatic arches inclose a large hollow space, whilst the bone also descends to an unusual depth from the arch, even below the lower jaw-bone. Within this structure, which gives an extraordinary breadth and peculiar aspect to the face, is a sac in each cheek, opening in front, and lined with a fold of the skin of the face. The whole of this seems to be intended to preserve the true cheek-pouches from external shocks. The cheek-pouches open from the mouth in the usual way, and are capable of very great distention. The lip is cloven; the ears are small; the eyes are large and full; the neck is short; the tail is a mere tubercle; the feet have each five toes; the legs are thick; the back is rounded. The form and gait are clumsy, yet the paca (*C. paca*) is very quick and active. It lives in moist grounds, burrowing like the rabbit, but not so deeply; its burrow, however, is always provided with three openings. It feeds on vegetable substances, and often does great damage to plantations of sugar-cane. It is one of the largest rodents, being about two ft. long. It is generally of a dark brown color, with four rows of white spots along the sides, the throat and belly white. A lighter-colored species has been described, but is perhaps a mere variety. The flesh of the paca is much esteemed, and is very fat. See illus., RODENTIA, vol. XII.

PACA, WILLIAM, 1740–99, b. Md.; educated in Philadelphia, and after graduating, 1759, studied law and was admitted to practice in 1764. He opened an office in Annap

olis, became a successful lawyer, and in 1771 was a delegate to the provincial legislature. From 1774 to 1777 inclusive he represented his state in the colonial and continental congress. He was a state senator for two years, and in 1778 was made chief judge of the superior court, and two years later became judge of the admiralty court of appeals. He was elected governor of Maryland in 1782, and again in 1786, and in the latter year was also a member of congress. For the ten years preceding his death he was a judge of the U. S. district court for the state of Maryland.

PACAY, *Prosopis dulcis*, a tree of the natural order *leguminosæ*, suborder *mimoseæ*; a native of Peru, of rather large size, with a broad head; producing pods from 20 in. to 2 ft. long, which contain black seeds imbedded in a sweet flaky substance as white as snow. This flaky substance is used as an article of food.

PACCHIONIAN BODIES, or GLANDULÆ PACCHIONI, numerous small, whitish granular looking bodies, collected together in clusters of varying size, found upon the human meninges, or cerebral membranes, principally in the following localities: 1. Upon the *outer* surface of the dura mater, in the superior longitudinal sinus, being received into little depressions, called Pacchionian depressions on the inner surface of the skull. 2. Upon the *inner* surface of the dura mater. 3. In the superior longitudinal sinus (a large venous canal, or vein, attached to the inner surface of the skull, running from before backward). 4. Upon the pia mater, near the margin of the hemispheres. The Pacchionian bodies are not glandular in structure, but are composed of a fibro-cellular matrix originally developed from the pia mater. Their growth and consequent pressure produces absorption of the dura mater through which they pass to the inner surface of the skull as well as into the superior longitudinal sinus. These bodies do not occur in infancy, and very seldom before the third year; usually after the seventh, increasing after this as age advances. Sometimes they are wanting. What purpose they may serve is not known.

PACE (Lat. *passus*), in its modern acceptation, is the distance, when the legs are extended in walking, between the heel of one foot and that of the other. Among disciplined men the pace becomes of constant length, and as such is of the utmost value in determining military movements, the relative distances of corps and men being fixed by the number of paces marched, and so on. The pace in the British army is $2\frac{1}{2}$ ft. for ordinary marching, and 3 ft. for "double quick" or running time.—With the Romans, the pace had a different signification, and it is important to bear the distinction in mind, when reading of distances in Latin works; the single extension of the legs was not with them a pace (*passus*), but a step (*gradus*); their pace (*passus*) being the interval between the mark of a heel and the next mark of the *same* heel, or a double step. This pace was equivalent to 4.84 English ft. The pace was the Roman unit in itinerary measure; the mile being 1000 paces, or 5,000 Roman ft. equal to .917 of an English mile. See MILE.

PACHA. See PASHA.

PACHECO, FRANCISCO, 1571–1654; b. Seville, Spain. His first lessons in painting were received from Luis Fernandez. Some stray prints of Raphael that he met he took as models. His first engagements were in decorative painting. In 1594–1600 he executed work for convents, palaces, and monuments. In 1611 he visited Toledo, Madrid, and the Escurial, where he made a thorough study of Titian and other great Italian and Spanish painters, and, returning to Seville, he opened a large academy of the arts, where he had numerous pupils. In 1618 he was appointed to the office of inquisitor of art, and with the duty of preventing the sale of pictures of nude figures. He received now more commissions than he could execute. In 1623 he accompanied his pupil and son-in-law, Velasquez, to Madrid, where, for two years, he mingled with artists and men of letters. On his return to Seville, his house was the resort of men of art and taste. His masterpiece was "The Last Judgment," an immense altar-piece finished in 1612 for the nuns of the convent of St. Isabel. Other works are "The Archangel Michael expelling Satan from Paradise," "Ignatius Loyola," and "The Baptism of Christ." In 1649 he published a treatise on *The Art of Painting*, containing much curious information and received as authority on the history of Spanish art.

PACHECO, ROMUALDO, b. Santa Barbara, Cal., 1831; was a member of the state legislature, 1853; was county judge, 1855–59; was a state senator, 1851, and again in 1861; was state treasurer, 1863, and lieut.-gov., 1871, becoming gov., 1873, upon Gov. Booth's election to the U. S. senate. He ran for congress on the repub. ticket, 1877, and was declared elected by one vote, but the house awarded the seat to P. D. Wigginton, dem. Mr. P. was subsequently elected to the XLVIth and XLVIIth congresses, and in 1890 was appointed U. S. Minister to Central America.

PACHMANN, VLADIMIR DE, pianist, born in Odessa, July 27, 1848. He first studied music under his father, a professor in the University of Odessa, an amateur violinist, and the friend of Beethoven, Weber, and other musicians of Vienna. Subsequently he was sent to the Conservatorium of Vienna, and returning to Russia in 1869, made his first appearance as a pianist, and played also in Germany and France. In 1882 he went to London, and in 1890, traveled in the United States, achieving success. He is esteemed by musicians and by the public as a pianist of high rank, and his playing of Chopin, of whom he has made a specialty, is much and justly admired.

PACHO'MIUS, an Egyptian monk of the 4th c., is held in high estimation by the Roman Catholic church, as being the first to substitute for the free asceticism of the

solitary recluse, a regular cenobitic system. He was born toward the close of the 3d c., was brought up as a pagan, but converted to Christianity by the kindness of certain Christians whom he encountered at Thebes. About 340 A.D., at Tabenna, an island in the Nile, he founded the first monastic institution. The members agreed to follow certain rules of life and conduct drawn up by Pachomius, and to subject themselves to his control and visitation. He also established the first convent for nuns, which was under the presidency of his sister, and labored with so much diligence and zeal, that at his death, according to Palladius, not fewer than 7,000 monks and nuns were under his inspection. The various writings extant under the name of Pachomius are: *Regulæ Monasticæ* (of doubtful genuineness), *Monita, SS. PP. Pachomii et Theodori, Epistolæ et Verba Mystica* (a farrago of unintelligible allegory), and *Præcepta S. Pachomii.* See *Acta Sanctorum,* vol. iii.

PACHYDERMATA (Gr. thick-skins), in the system of Cuvier, an order of mammalia, including part of the *bruta* (rhinoceros, elephant), and all the *bellua* (horse, hippopotamus, tapir, hog, etc.) of Linnæus, besides one genus (*hyrax* or daman) of the Linnæan *glires.* It has been often described as less natural than any other of Cuvier's mammalian orders, as it consists of animals among which there are wide diversities, and the associating characters are rather negative than positive; but it is now universally received by naturalists as indicating a real, though not a close affinity; and when we extend our view from existing to fossil species, numerous connecting links present themselves. As defined by Cuvier, the order consists of those hoofed mammalia (*ungulata*) which are not ruminants; all of which possess, as a more positive character, a remarkable thickness of skin. This order he divides into three sections: (1) *Proboscidea,* having a prolonged snout or proboscis, through which the nostrils pass as elongated tubes, a powerful organ of prehension, and a delicate organ of touch, and having also five toes on each foot, inclosed in a very firm horny skin; (2) *ordinaria,* destitute of proboscis, although in some (tapirs) there is such an elongation of the upper lip and nostrils as approximates to it; and the nose is employed by hogs, etc., in seeking their food, not only as an organ of smell, but as an instrument for turning up the ground, and as an organ of touch; the number of toes varies, four, three, or two on each foot; those with an even number of toes having in the cleft foot a resemblance to the *ruminantia;* and (3) *solidungula,* in which the foot has but one apparent toe, inclosed in a hoof. Some naturalists have thought it better to separate the *solidungula* or *equidæ* (q.v.) from the pachydermata, as a distinct order; whilst others have enlarged instead of restricting the limits of the order, by adding, as a fourth section, the *herbivorous cetacea,* now known as *Sirenia.*

Those pachydermata which have a number of toes differ completely from the mammalia having claws (*unguiculata*) in their inability to bend their toes in order to seize any object. Some of the *edentata* have very large hoof-like claws, but this difference still subsists. The fore-limbs of the pachydermata are also incapable of any rotatory motion, serving for support and locomotion only, not at all for prehension; the metatarsal and metacarpal bones being consolidated as in the *ruminantia,* and they have no clavicles.

The largest terrestrial mammalia belong to this order. Most of the pachydermata are of large size, although the damans are a remarkable exception, and some of the hog family are also comparatively small. Most of them have a clumsy form, with a slow and awkward gait; but they are capable of activity beyond what might be supposed, and sometimes move at a pretty rapid pace. Gracefulness and fleetness are characteristics of the otherwise exceptional *solidungula.* The *P. ordinaria* have generally great strength, and the larger ones push their way through the entangled thickets of tropical forests, bending or breaking the lianas, small trees, and branches which oppose their progress, their thick hides resisting the spines and broken branches by which the skins of other animals would be pierced. The horse and other *solidungula* are not inhabitants of forests and jungles, but generally of grassy plains, and their hides are much less thick and hard than those of most of the pachydermata.

The physiognomy of the pachydermata in general is rather dull and unexpressive, the eyes being small, and having that character of which a familiar example is found in the common hog. When enraged, however, they manifest their fierceness in their eyes; and although, in general, mild and gentle, they are capable of being aroused to great fury.

The skeleton of the *P. ordinaria* and *proboscidea* is strong and massive; the neck short, the processes of its vertebræ strongly developed; the skull affording a large surface for the muscles which support and move it.

The pachydermata generally feed on vegetable substances. Some are omnivorous. The digestive organs are more simple than in the *ruminantia,* but exhibit considerable diversity. The stomach is simple in some, and in others is more or less completely divided into sacks, approaching to one of the most remarkable characters of the *ruminantia.* The intestines are generally longer than in the *ruminantia.* The dentition exhibits considerable diversity; the adaptation to vegetable food being the most prevalent character. The most important peculiarities of the dentition and digestive organs are noticed in the articles on particular families and genera.

PACIFIC, a co. situated in s.w. Washington, has the Columbia river for its s. boundary; the Pacific ocean on the w., and Shoalwater bay on the n.w., an estuary of the Pacific ; 896 sq.m.; pop. 1890, 43,058, chiefly of American birth, with colored. Cape Hancock (formerly

VLACKE VARK
(Sus scrofa)

INDIAN RHINOCEROS
(Rhinoceros unicornis)

KUDA-AYER
(Tapirus malayanus)

PACHYDERMATA.

UNIVERSITY OF

Cape Disappointment) is in the extreme s.w. section. It is drained by the Willopah river, emptying into Shoalwater bay, and other small streams flowing into the ocean. A large proportion of the surface is covered with timber, and is hilly. The soil in the Willopah valley is fertile, and adapted to stock-raising and the cultivation of grain. Its mineral products are Columbia cement-rock and silver. Lumber and wool are the chief commodities, and fishing and the oyster trade are the principal industries. Co. seat, South-bend.

PACIF'IC OCEAN, the largest of the five great oceans (see OCEAN), lies between America on the e., and Asia, Malaisia, and Australasia on the west. The name "Pacific," given to it by Magellan, the first European navigator who traversed its wide expanse, is doubtless very appropriate to certain portions of this ocean; but as a whole, its special claims to the epithet are at the least doubtful, though the name has by long usage become too well established to be easily supplanted by any other.

The greatest length of the Pacific ocean from the Arctic (at Behring's strait) to the Antarctic circles is 9,200 m., and its greatest breadth, along the parallel of lat. 5° n., about 10,300 m.; while its area may be roughly estimated at 70,000,000 English sq.m., or about two-fifths of the whole surface of the earth. Its form is rhomboidal, with one corner incomplete (at the s.), and its surface is studded with numberless islands, either scattered or in groups; these, however, are chiefly confined to the western side. Along the whole eastern side there is a belt of sea of varying width, which, with a very few exceptions, is wholly free from islands. The deepest sounding yet found in the Pacific ocean is 27,930 ft., or above 5 m.—nearly equal to the height of the highest mountain on the globe.

The coasts of the Pacific ocean present a general resemblance to those of the Atlantic, and the similarity in the outline of the western coasts of each is even striking, especially n. of the equator; but the shores of the former, unlike those of the latter, are sinuous, and, excepting the n.e. coast of Asia, little indented with inlets. The shore on the American side is bold and rocky, while that of Asia varies much in character.

Though the Pacific ocean is by far the largest of the five great oceans, being about equal to the other four in extent, the proportion of land drained into it is comparatively insignificant. Its basin includes only the narrow strip of the American continent to the w. of the Andes and Rocky mountains; Melanesia (with the exception of almost the whole of Australia), which contains few rivers, and none of them of large size; the Indo-Chinese states, China proper, with the e. part of Mongolia, and Manchuria in the Asiatic continent.

Winds.—The trade-winds of the Pacific have certain peculiarities, which have only lately been discovered. In general, they are not found to preserve their peculiar characteristics except within certain limits, thus, the s.e. trades are found to blow steadily only between 92° and 140° of w. long.; while the n.e. trades are similarly fluctuating, except between long. 115° w. and 214° w. Beyond these limits, their action is in whole or in part neutralized by the monsoons and other periodical winds peculiar to the tropical regions of the Pacific. In Polynesia, especially near the New Hebrides group, hurricanes are of frequent occurrence from November to April, but they exhibit few of the terrible characteristics which distinguish the hurricanes of the West Indies and Indian ocean. North and s. of the tropical zone the winds exhibit little periodicity, being found to blow from all parts of the compass at any given season of the year, though a general westerly direction is most frequent among them. On the coast of Patagonia and at cape Horn, w. winds prevail during the greater part of the year, while in the sea of Okhotsk they are of rare occurrence. The frightful typhoon (q.v.) is the terror of mariners in the Chinese seas, and may occur at all seasons of the year. There are many other winds and storms, such as white squalls, cyclones, "tempestades," etc., which are confined to particular localities, and will be found noticed under other heads, and also under STORMS.

Currents.—The currents of the Pacific ocean, though less marked in character and effects than those of the Atlantic, are yet of sufficient importance to require a brief notice. The *Southern Pacific current* takes its rise s. of Van Diemen's Land, and flows eastward at the rate of half a mile per hour, dividing into two branches about long. 98° w., the northern branch, or *current of Mentor*, turning northward, and gradually losing itself in the counter equatorial current; the southern branch continuing its eastward course until it is subdivided by the opposition of cape Horn into two branches, one of which, *the cold current of Peru*, or *Humboldt's current*, advances northward along the w. coast of South America, becoming finally absorbed in the equatorial current; the other washing the coast of Brazil, and becoming an Atlantic current. The Pacific ocean, like the Atlantic, also possesses its equatorial current, separated into a northern and southern current by the equatorial counter-current. It sweeps across the whole ocean from e. to west. Two subdivisions of the southern current, called respectively the "current of Rossel" and the "warm current of Australia," flow, the one through the Polynesian archipelago to New Guinea, and the other along the e. coast of Australia. The northern equatorial current, after reaching the coast of Asia, turns n.e., washing the shores of China and Japan, under the name of the *black* or *Japan current;* it then sends off a branch along the coast of Kamtchatka, and advances eastward till it becomes

lost on the n.w. coast of North America. There are other minor currents, the most remarkable of which is Fleurieu, which describes a kind of irregular circle with a radius of about 240 miles. It is situated in lat 25° to 40° n., and long. 133° to 155° west. All these currents have their corresponding counter-currents.

There are two "sargassos" or weedy seas of considerable extent in the Pacific ocean, one lying 15° e.s.e. of New Zealand; the other, and by far the larger, about 15° w. of San Francisco in California. There is also a large region lying nearly half-way between cape Horn and New Zealand, which seems to correspond to the deserts on land, as mariners report it almost wholly destitute of any signs of life either in sea or air.

History.—The existence of this ocean first became known to Europeans through Columbus, who had received accounts of it from some of the natives of America, though it was first seen by Balboa, Sept. 29, 1513, and first traversed by Magellan 8 years afterwards; but its size, limits, and the number and position of its islands, etc., were little known till long afterwards. Capt. Cook deserves the first place among the investigators of the Pacific ocean; and after him come Anson, the two Bougainvilles, La Perouse, Carteret, Vancouver, Kruzenstern, Kotzebue, etc. But the most thoroughly scientific examination of its physical condition is that accomplished by the *Challenger* expedition of 1873–76.

PACINIAN CORPUSCLES are very remarkable structures appended to the nerves. In the human subject they are found in great numbers in connection with the nerves of the hand and foot, and sparingly on other spinal nerves, and on the plexuses of the sympathetic, but never on nerves of motion. They always present a *proximal end*, attached to the nerves by a stalk of fibrous tissue prolonged from the neurilemma, and occasionally one-tenth of an inch long; and a *distal end*, lying free in the connective or areolar tissue. In the human subject the corpuscles vary in length from one-twentieth to one-tenth of an inch. They are usually seen very readily in the mesentery of the cat, appearing as pellucid oval grains, rather smaller than hemp-seed. The microscopic examination of these bodies discloses an internal structure of a very remarkable kind. They consist, first, of a series of membranous capsules, from 30 to 60 or more in number, inclosed one within the other; and secondly, of a single nervous fiber, of the tubular kind, inclosed in the stalk, and advancing to the central capsule, which it traverses from beginning to end, and where it finally terminates in a fixed swollen extremity. The 10 or 15 innermost capsules are in contact with one another, while the rest are separated by a clear space containing fluid, which is so abundant as to constitute far the largest portion of the bulk of the entire corpuscle. Such are the views of Pacini (as given in his *Nuovi Organi Scoperte nel Corpo Umano*, 1840), who is usually regarded as their discoverer, although they had been noticed and roughly described nearly a century before by Vater, of Henle, and of Todd and Bowman; but later observations made by Huxley, Leydig, Kölliker, and others, show that the question of their true nature is still an open one. Huxley asserts that their central portion is solid, and not hollow; that in birds, and in the human hand, there is no fluid between the laminæ—and indeed, that the laminæ themselves have no real existence—the Pacinian corpuscle being merely a solid mass of connective tissue (a thickened process of the neurilemma of the nerve to which it is attached), whose *apparent lamination* depends on the regular disposition of its elastic elements. If Pacini's views of these structures be correct, there is probably some general analogy between the electric organs of the torpedo and those corpuscles; at present we know nothing with certainty regarding their office. See Quain's *Anatomy*.

PACKARD, Alpheus Spring, d.d., b. Chelmsford, Mass., 1798; a graduate of Bowdoin college, Maine, class of 1816; was college tutor for 5 years afterwards, and became a Congregational minister. In 1824 he was called to fill the chair of professor of Latin and Greek languages and literature at Bowdoin college, serving till 1865. In 1865 he became Collins professor of natural and revealed religion, and librarian in 1869. He married the daughter of Jesse Appleton, d.d., president of Bowdoin college, 1807–19, and in 1837 published Appleton's works, in 2 vols., embracing lectures on theology, addresses, and sermons, with a memoir prefixed. His wife's sister married President Franklin Pierce. Among other works by his pen there appeared, in 1839, *Xenophon's Memorabilia of Socrates*, edited with English notes, later edition 1843; in 1853 *History of the Bunker Hill Monument Association*. Dr. P. was a contributor to the *North American Review* and other periodicals. He d. 1884.

PACKARD, Alpheus Spring, Jr., b. Brunswick, Me., 1839; son of the Rev. Dr. Alpheus Spring; graduated at Bowdoin college, Maine, class of '61; studied natural history at the museum of comparative zoology connected with Harvard university, attending mainly to the department of entomology. In 1864 the Maine medical school at Brunswick conferred upon him the degree of m.d. He has made several excursions in the interest of his profession in Maine and elsewhere, lectured for several years on entomology at Bowdoin college, was curator of the Peabody academy of sciences at Salem, Mass., and one of the editors of the *American Naturalist* published by that institution. In 1868 he established the *Annual Record of Entomology*, which he has since edited. He published in 1867, *Observations on the Glacial Phenomena of Labrador and Maine, with a view of the Recent Invertebrate Fauna of Labrador*; in 1868–69, *A Guide to the Study of Insects*, of which later editions have been issued; and a treatise on those insects injuri

ous and beneficial to crops, for the use of colleges, farm-schools, and agriculturists. In 1875 he published *Half Hours with Insects;* later publications are *Outlines of Comparative Embryology*, and *Zoology*, both illustrated. He became professor of geology and zoology in Brown university, Providence, R. I., in 1878.

PACKARD, FREDERICK ADOLPHUS, LL.D.; 1794–1867; b. Mass.; graduated at Harvard college, 1814; studied law at Northampton, Mass., and practiced at Springfield, Mass., 1817–29, editing also the *Federalist* newspaper; was editor of the publications of the American Sunday-school union, Philadelphia, 1829–67, also of its periodicals for a large part of that time; declined the presidency of Girard college at Philadelphia, 1849; published the *Union Bible Dictionary, The Teacher Teaching, Life of Robert Owen*, etc.

PACKER, ASA, 1806–79, b. Groton, Conn.; d. Philadelphia; began as a poor boy, walking from Conn. to Penn. in search of employment; worked as a carpenter in Susquehanna co., Penn., and New York; lived for 10 years as a pioneer on the upper Susquehanna. He undertook the charge of one of the first boats of the Lehigh Canal co., from Mauch Chunk to tide-water, and rapidly rose to the position of a contractor for the building of locks on the Lehigh river, and of boats for the transportation of coal from Pottsville to New York. He was the projector of the Lehigh Valley railroad, built in 1852, and of the railroad from Mauch Chunk to Erie. He served in the Penn. legislature, 1844. He was twice elected as a democrat to congress, serving 1853–57, and was a prominent candidate for the presidency of the U. S. before the democratic convention of 1868. Having amassed great wealth, he made munificent use of it, his most notable charity being the founding and full endowment of Lehigh university at Bethlehem, Penn., with its many complete departments, for furnishing to young men a free collegiate education.

PACKER COLLEGIATE INSTITUTE, Brooklyn, N. Y., founded, 1845, under the title of the Brooklyn Female Academy, and opened, 1846, May 4. In 1853 it was destroyed by fire, when Mrs. Harriet L. Packer, widow of William S. Packer, endowed it with $65,000 out of her late husband's estate, with the desire of associating his name with some permanent public work. The restored building was opened, 1854, Nov. 9, under its present name. It contains 30 study and recitation rooms, a library with over 7000 volumes, a chapel, studios, laboratory, and gymnasium, and is surrounded by handsome grounds. Its aim is to provide liberal education for young women through the several grades of primary, academic, and collegiate instruction. Pres., Truman J. Backus.

PACKFONG, or PETONG', a Chinese alloy or white metal, consisting of arsenic and copper.

PACK-HORSE, a horse employed in the carriage of goods, which are either fastened on its back in bundles, or, if weighty, are placed in panniers, slung one on each side across the horse's back. The saddle to which the bundles were fastened consisted of two pieces of wood, curved so as to fit the horse's back, and joined together at the ends by other two straight pieces. This frame was well padded underneath, to prevent injury to the horse's back, and was firmly fastened by a girth. To each side of the saddle a strong hook was attached, for the purpose of carrying packages, panniers, etc. Panniers were sometimes simply slung across the horse's back with a pad under the band. The panniers were wicker baskets, and of various shapes, according to the nature of their usual contents, being sometimes long and narrow, but most generally having a length of three feet or upwards, a depth of about two-thirds of the length, and a width of from one to two feet. The pack-horse with panniers was at one time in general use for carrying merchandise, and for those agricultural operations for which the horse and cart are now employed; and in the mountainous regions of Spain and Austria, and in other parts of the world, it still forms the sole medium for transport; though the mule has, especially in Europe, been substituted for the horse.

An army requires to be accompanied by several thousand pack-animals, sometimes horses, but preferably mules; and in Asia, commonly camels, or even elephants. Pack-saddles are variously fitted, according to the objects to be carried; some for provisions or ammunition; others for carrying wounded men, tents, and in mountain-warfare, even small cannon. In battle, the immediate reserves of small-arm ammunition are borne in the rear of divisions by pack-animals; the heavy reserves being in wagons between the army and its base of operations.

PACTO'LUS, anciently the name of a small brook of Lydia, in Asia Minor, which rises on the northern slope of Mount Tmolus (modern *Buz Dagh*), flows north past Sardis (*Sart*), and empties itself into the Hermus (*Kodus*). It is never more than 10 ft. broad, and 1 ft. deep. The sands or mud of Pactolus were long famous in antiquitity for the particles of gold dust which they contained, and which are supposed to have been carried down by its waters from the bosom of Tmolus—a hill rich in metals. The collection of these particles, according to legend, was the source of Crœsus's vast wealth. But as early even as the time of Strabo, Pactolus had ceased to yield any of the precious dust. The brook is now called *Sarabat.*

PACTUM ILLICITUM is, in the law of Scotland, a contract or agreement for some illegal purpose, i.e., a purpose either expressly prohibited by statute, or by the general policy of the law. Thus, an immoral contract between a man and woman would be held

void on the ground, that the law discountenances practices *contra bonos mores*. A contract between a client and agent, called a *pactum de quota litis*, whereby a share of the property which is the subject of litigation is given to the agent instead of his usual fees, is void in most cases; though it is often difficult to determine what contracts fall within this rule. The courts, however, have construed very jealously every contract which tends to corrupt the administration of the law, and hence an agreement between a town and country agent to divide the profits has been held a *pactum illicitum*. So agreements by a client to give an excessive sum to his law-agent as a gift have been often set aside. In England, similar doctrines prevail, though the phrase *pactum illicitum*, which was borrowed from the Roman law, is not used, contracts of this description being technically described as illegal contracts.

PACUVIUS, MARCUS, b. at Brundusium, Italy, about B.C. 220, d. about B.C. 132. Repairing to Rome he soon acquired fame by his skill in poetry and painting. One of his pictures was hung in the temple of Hercules in the Forum Boarium at Rome. But his finest works were his tragedies, which showed eloquence and refinement. The fragments of Pacuvius have been printed in Stephen's *Fragmenta Veterum Poetarum*, and in Bothe's *Poetarum Latii Scenicorum Fragmenta*.

PADANG, the capital of the Dutch government of the w. coast of Sumatra, is situated in 0° 59′ 30″ s. lat., and 100° 20′ 30″ e. long., and has about 12,000 inhabitants. The Padang flows through the town, but is navigable for small vessels only, the larger requiring to anchor in the roadstead, about 3 m. distant. On the left bank, stand the houses of the natives, unsightly bamboo erections, elevated about 8 ft. from the ground by posts of the cocoa-nut tree, and covered with leaves. The government buildings, houses of the Europeans and Chinese, etc., are on the right, and mostly built of wood or stone, and roofed with tile. Padang is picturesquely inclosed by a semicircle of mountains, behind which rises a loftier chain, two being volcanoes. There are a Protestant church, a Roman Catholic church, flourishing schools, a fort, military hospital, government workshops, large warehouses, etc. An agent of the Netherlands Trading company resides at Padang. Being the center of the exports and imports of Sumatra's w. coast, Padang has a lively trade, not only with Java, the other islands of the eastern archipelago and Europe, but also with the interior of the island.

The climate is considered healthy, although the heat is great. Colonel Nahuys found the thermometer range from 70° to 80° at 6 A.M., from 82° to 88° at noon, 84° to 90° at 2 P.M., 78° to 84° at 6 P.M., and from 72° to 80° at 10 in the evening.

The governor resides at a country-house about 2½ m. above Padang, and rules over a territory stretching from the residency of Bencoolen (which stands immediately under the government at Batavia), n.w. over 7° of latitude. It is divided into the residencies of lower Padang, upper Padang, and Tapanoeli (Tapanuli), Bencoolen, the Lampongs, and Palembang. The population of Padang was in 1891, 1,041,583, of whom 2263 were Europeans, 7994 Chinese and 920 Arabs.

Lower Padang was the first district of the w. coast of Sumatra which submitted to the Dutch, who had formed a settlement at Padang as early as 1660, and by repeated wars gradually extended their territory.

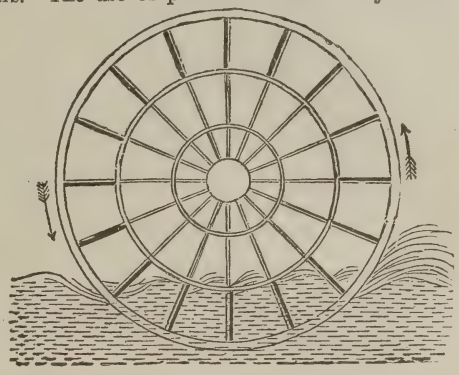
Upper Padang lies to the n.w. of the lower province, from which it is separated by a chain of lofty mountains, some of which, as the Singalang, Merapie, and Sago, attain to nearly 10,000 ft. in height,—Merapie being an active volcano, the last eruptions of which were in 1845 and 1855, though it sent forth volumes of smoke in 1861. This residency possesses the most lovely districts of the island, or of any tropic land, the mountain slopes being studded with villages, rice-fields, cocoa-nut and coffee-trees. In addition to the coffee-culture, gambier, cassia, pepper, rattans, indigo, caoutchouc, etc., are largely produced, and gold, iron, copper, lead, and quicksilver are found. In the district of Tanah Datar is the town of Paggeroejong, formerly the capital of the powerful kingdom of Menangkabo, and the residence of the king.

Tapanoeli, the remaining residency under the government of Sumatra's w. coast, lies n.w. from upper Padang. The independent spirit of the inland natives has caused the Netherlanders much trouble, but each fresh outbreak only extends their territory and power further into the interior, and towards the n.w. of the island.

PADDLE, probably the precurser of the oar (q.v.), and still its substitute among barbarous nations, is a wooden implement, consisting of a wide flat blade with a short handle, by means of which the operator spoons the water towards him. In canoes for only one sitter, a double paddle is generally used, which is dipped alternately on either side: the inhabitants of Greenland are especially skillful in this operation. The action of the paddle is the same as that of the oar. The paddle has, however, one advantage—viz., that the rower faces the bow of his boat, and therefore sees what is before him. In threading narrow streams, etc., this is an appreciable gain.

PADDLE-FISH, *Polyodon folium*, a fish inhabiting the Mississippi river and its tributaries. It is about 5 ft. long, without scales, and has a long, bony snout of about the length of the body, with which it plows or digs up the mud of the bottom in search of food. It has a dark bluish back and a whitish belly.

PADDLE-WHEEL—one of the appliances in steam-vessels by which the power of the engine is made to act upon the water and produce locomotion—is a skeleton wheel of iron, on the outer portion of whose radii flat boards, called floats or paddles, are fixed, which beat upon the water, and produce, continuously, the same effect as is given, in an intermittent manner, by the blades of oars. The use of paddle-wheels in conjunction with steam as a motive-power dates from about the commencement of the present century, but the employment of the paddle-wheel itself is as ancient as the time of the Egyptians. A specimen is also known to have been tried in Spain in the 16th century.



The Fig. shows the usual form of paddle-wheel, that called the radial, in which the floats are fixed. It will be seen that a certain loss of power is involved, as the full force of the engine on the water is only experienced when the float is vertical, and as on entering and leaving the water the power is mainly employed in depressing or lifting the particles of water. This objection has great force at the moment of starting, or when progress is very slow, as is illustrated by the small power a paddle-steamer evinces when trying to tug a stranded vessel off a sandbank; but when in full progress, the action is less impeded by this circumstance, the water in front of the wheel being depressed, and that abaft being thrown into the form of a wave. The extent of the immersion much influences the economy of power, as will be readily understood if the consequences of immersion up to the center of the wheel be imagined. An immersion somewhat over the top of the lowest float is about the most advantageous, and in order that the floats may be as nearly as possible vertical when they strike the water, it is advisable to give the wheel as large a diameter as possible, and to place the axis at the highest available point in the vessel.

To overcome the drawbacks to the radial wheel, Elijah Galloway patented, in 1829, the *feathering paddle-wheel*, in which the floats are mounted on axes, and are connected by rods with a common center, which revolves upon a pin placed eccentrically to the axis of the paddle-wheel. By this method the floats are kept, while immersed, at right angles to the surface of the water. So long as the water is smooth the gain is great, consequently feathered floats are much used in river-steamers. Paddle-wheels have been entirely superseded by screw propellers on all vessels except river boats.

The paddle-wheel, in revolving, imparts both a forward velocity to the vessel and a backward velocity to the water. The latter is called the *slip*, and sometimes bears a very large and wasteful proportion to the former. The absolute velocity of the paddle floats is equal to the sum of the slip and the forward motion of the ship, so that the wheel always revolves faster than the ship makes way. See STEAM NAVIGATION.

PADDOCK, ALGERNON SIDNEY, b. Glenn's Falls, N. Y., 1830; was educated at the acad. in that place; studied law, and removed to Omaha, Neb., 1857; was a delegate to the first territorial repub. convention of Neb., 1859; was sec. of Neb., 1861, until its admission as a state, 1867, and acted as governor for a large part of this period; was repub. candidate for congress, 1866; U.S. senator from Neb., 1875–81; re-elected, 1887.

PADDOCK, BENJAMIN HENRY, D.D., b. Conn., 1828; graduated at Trinity college in 1848, and at the Episcopal general theological seminary, New York, in 1852; was assistant at Epiphany church, New York, 1852–53; rector of Trinity church, Norwich, Conn., 1853–60; of Christ church, Detroit, Mich., in 1860–69, and of Grace church, Brooklyn, 1869–73. He was consecrated bishop of Massachusetts, Sept. 17, 1873, and d. 1891.

PADDOCK, JOHN ADAMS, D.D., b. Norwich, Conn., 1825; graduated at Trinity college, Hartford, Conn., 1845, and at the General theological seminary, 1849; was ordained priest in the Protestant Episcopal church, 1850. He was for a number of years the highly efficient rector of St. Peter's church, Brooklyn; and was consecrated missionary bishop of Washington territory, 1880. Died March, 1894.

PADDY, or PADDIE, the name commonly applied in India to rice in the husk. It is the Tamul and the Malay name. See RICE.

PADEL'LA (Ital. a frying-pan; plur. *padelle*), a shallow vessel of metal or earthenware used in illuminations. The illumination of St. Peter's at Rome, and other large buildings in Italy, is effected by the tasteful arrangement of large numbers of these little pans, which are converted into lamps by partly filling them with tallow or other grease, and placing a wick in the center. This mode of illumination was first adopted on a large scale in Great Britain on the occasion of the marriage of the prince of Wales with the Princess Alexandra, when the inhabitants of Edinburgh produced by this means a most magnificent illumination of their city.

PADERBORN, the chief t. of a district in the Prussian province of Westphalia, situated in 51° 43′ n. lat., and 8° 45′ e. long., in a pleasant and fruitful district, is built at the source of the Pader, which bursts forth from below the cathedral with sufficient force to drive mills within 20 paces of its point of exit. Pop. '95, 19,941. Paderborn has narrow, dark, old-fashioned streets, presenting no special attractions, although it has some interesting buildings, as, for instance, the fine old cathedral, completed in 1143, with its two magnificent façades, and containing the silver coffin in which are deposited the remains of St. Liborius. It is the seat of a bishop and chapter, and of an administrative court. The manufactures of Paderborn, which are not very considerable, include tobacco, starch, hats, and wax-cloths, and there are several-breweries, distilleries and sugar-refineries in the town, which carries on a considerable trade in cattle, corn, and oils. Paderborn is one of the important stations on the Great Westphalia railway. Paderborn, which ranked till 1803 as a free imperial bishopric, owes its foundation to Charlemagne, who nominated the first bishop in 795. Several diets were held during the middle ages at Paderborn, which at that period ranked as one of the most flourishing of the Hanseatic cities, while it was also numbered among the free imperial cities. In 1604 it was forcibly deprived by the prince-bishop, Theodore of Fürstenburg, of many of the special rights and prerogatives which it had enjoyed since its foundation, and compelled to acknowledge the Roman Catholic as the predominant church, in the place of Protestantism, which had been established during the time of Luther. In 1803 Paderborn was attached as an hereditary principality to Prussia, and, after being for a time incorporated in the kingdom of Westphalia, was restored to Prussia in 1813, and incorporated in the Westphalian circle of Minden.

PADEREWSKI, Ignace Jan, was born at Podolia in Russian Poland, Nov. 6, 1860. When only three years of age, he showed great fondness for music, and at seven was placed under a teacher, making such rapid progress as a pianist that in five years he gave public recitals. He studied under Jonatha at the Warsaw conservatory, in which he became himself a professor at the age of 18. In 1884 he accepted a similar position at Strassburg, and in 1887 made his formal début in Vienna, and was at once placed in the foremost rank of pianists. In 1890 he created a furor in London by his marvellous playing, and in 1892, 1893, and 1895–96 appeared in the United States. As an artist, Paderewski must be placed among the very greatest performers that the world has yet seen. His pronounced individuality, his freedom from any of the tricks with which too many pianists seek to create effect, his vivid appreciation of tone-gradations and values, his wonderful technique and mastery of the pedal, and his singularly intellectual conception of the great masterpieces that he interprets give him a place with Rubinstein and Liszt in the history of modern music. For his three months' season in the United States in 1895–96, he received the net sum of $200,000, and he gave to trustees, for a fund to encourage American composers, $10,000.

PADILLA, Juan de, b. about 1484, a popular hero in Spanish history, was a scion of a Toledan family, and was appointed by the emperor Charles V. military commandant of Saragossa. While he was so employed, a formidable rebellion, caused by the excessive taxes which the emperor imposed on the Spaniards to defray the cost of his various wars in Italy, Germany, and the Low Countries, broke out among the towns (*communidades* of Castile, and the rebels, who were known as *communeros*, called upon Padilla to put himself at their head. The introduction of the religious element into the quarrel tended greatly to strengthen the insurgents, and for an instant Padilla was the ruler of Spain, and formed a new junta to carry on the government. He was successful in a number of enterprises undertaken against the royalist party; but on April 23, 1521, was completely beaten by the royalists at Villalos. This conflict decided the fate of the rebellion, and of Padilla himself, who was taken prisoner, and next day beheaded.

His wife, Dona Maria Pacheco, rallied the wrecks of the rebel army, and for a long time held Toledo against the royalist besieging army, and after its fall retired to Portugal, where she died soon afterwards. With Padilla and his wife expired the last remnant of the ancient freedom of Spain. Numerous poems and dramas celebrated their deeds.

PADISH′AH, in Turkish Padishag (Persian *padi*, protector or throne; *shah*, prince), one of the titles of the sultan of the Ottoman empire, and of the shah of Persia. Formerly this title was accorded only to the kings of France among European monarchs, the others being called *kral*, king. It was subsequently allowed to the emperor of Austria, and still later, by a special article in the treaty of Kutshuk-Kainardji (Jan. 10, 1775), to the autocrat of all the Russias. Of late it has been accorded to the monarchs of all the great European nations, and even to those of secondary states.

PADUA, a province of Italy, in Venetia, called by the Italians Padova, having on the n. Treviso, on the e. Venice, on the s. Rovigo and the river Adige, on the w. Vicenza and Verona, on the s.e. the Adriatic sea or gulf of Venice; 823 sq. m.; pop. '95, 448,946 (est.). It is about 40 m. in length from n. to s., its greatest breadth 30 m., its narrowest portion 15 miles. Its surface is generally level, rising in the s.w. into the volcanic district of the Euganean hills, which extend from the vicinity of Padua to Este, and are separated from the Alps by the Paduan plain. Near these hills are mineral springs of great value. The principal towns are Este, Montagnana, Abano, and Battaglia, near which city is the village of Arquà, where Petrarch died. Capital, Padua.

PADUA (Ital. *Padova*), capital of the province of the same name in n. Italy, stands on a beautiful plain on the Bacchiglione, 26 m. by railway w.s.w. of Venice. It is surrounded by walls and ditches, and is fortified by bastions. Its houses are lofty, supported for the most part on long rows of arches, generally pointed, and most of its streets, especially in the older quarters, are narrow, dark, dirty, and ill-paved. There are, however, several handsome gates, as those of San Giovanni, Savonarolo, and Falconetto; a number of fine squares, of which the Prato della Valle is the largest and the finest, and is surrounded by a stream, and planted with trees; and several magnificent buildings. Of these the café Pedrocchi is esteemed the finest edifice of the kind in Italy. Portions of a Roman edifice were discovered while the foundations of this building were being made, and the marbles found now adorn the pavement, etc., of the *salone*. The Palazzo della Municipalità, built 1172–1219, is the most peculiar and the most national in the city. It is an immense building, forming one side of the market-place, rests wholly on arches, and is surrounded by a loggia (q.v.). Its e. end is covered with shields and armorial bearings, and its roof is said to be the largest unsupported by pillars in the world. Its hall is 267½ ft. long, and 89 ft. wide, is covered with mystical and metaphorical paintings, and contains a monument of Livy, the Roman historian, and a bust of Belzoni, the traveler, both natives of this city. The other chief edifices are the cathedral, the church of Sant' Antonio, a beautiful building in the pointed style, with several Byzantine features, and remarkably rich and splendid in its internal decorations; and the churches of San Giorgio and Santa Giustina; all of them richly decorated with paintings, sculptures, etc. The university of Padua, the most famous establishment in the city, was celebrated as early as the year 1221. It embraces 61 professors and other teachers, and is attended by about 1300 students. Connected with the university are an anatomical theater and a botanic garden, both dating from the 16th c., and each the first of its kind in Europe. There is also a museum of natural history, an observatory, a chemical laboratory, and a library of 123,000 volumes and 2500 manuscripts. There are also numerous palaces, theaters, and hospitals. Pop. '94, 80,800.

Padua, the Roman *Patavium*, is one of the most ancient towns of Italy. According to a wide-spread belief of antiquity, alluded to by Virgil, it was founded by the Trojan chief Antenor, but we really know nothing of its history until it became a Roman town. During the first centuries of the empire, it was the most flourishing city in the north of Italy, on account of its great woolen manufactures, and could return to the census more persons wealthy enough to be ranked as *equites* than any other place except Rome. But in 452 Attila utterly razed it to the ground. It was, however, rebuilt by Narses, again destroyed by the Lombards, but once again rose from its ashes, and became a very famous city in the middle ages. It fell into the hands of the Carrara family in 1318, and in 1405 it was conquered by Venice, the fortunes of which it has since shared.

PADU'CAH, city and co. seat of McCracken co., Ky.; at the junction of the Ohio and Tennessee rivers, and on the Illinois Central and the Nashville, Chattanooga, and St. Louis railroads; 48 miles n.e. of Cairo, Ill. It was incorporated as a village in 1828 and chartered as a city in 1856. It contains a U. S. government building, the Illinois Central railroad hospital, electric light and street railroad plants, waterworks supplied from the Ohio river, national and state banks, about 20 churches, and several public parks. The city has a large number of tobacco factories and tobacco warehouses, shipbuilding plant, and other industries. Pop. '90, 12,797.

PADU'LA, a t. of s. Italy, in the province of Salerno, 52 m. s.e. of the town of Salerno, in a mountainous district. Below Padula are the ruins of the once famous and magnificent monastery, *La Certosa di S. Lorenzo*, despoiled by the French during their occupation of Calabria. Pop. 7,900.

PÆAN (of doubtful etymology), the name given by the ancient Greeks to a kind of lyric poetry originally connected with the worship of Apollo. The oldest pæans, as we learn from Homer, appear to have been either hymns, addressed to that deity for the purpose of appeasing his wrath (*Iliad*, i. 473), or thanksgiving odes, sung after danger was over and glory won (*Iliad*, xxiii. 391). Nevertheless, at a later period they were addressed to other deities also. Thus, according to Xenophon, the Lacedæmonians sung a pæan to Poseidon after an earthquake, and the Greek army in Asia one to Zeus.

PAER', Ferdinando, 1771–1839; b. Italy; chapel-master at Dresden, imperial composer to Napoleon, and director of the Italian opera at Paris 1812–27. Besides a number of operas, such as *Griselda, Leonora, Camilla, Dido*, etc., he composed overtures and cantatas of merit.

PAEZ', José Antonio, 1790–1873; b. Venezuela; raised a force of revolutionists in 1810, and defeated the Spanish troops under Lopez in 1815. He inflicted another defeat upon the royalists in 1816, and was appointed brig.gen. in command of the revolutionary army. He again defeated Lopez, and secured control of the province of Apure. In 1817 he recognized the authority of Bolivar, and two years later he became gen. of division, and worsted Gen. Morillo in several engagements. The victory which he won at Carabobo in 1821 effected the independence of Colombia. Upon the erection of the new state, he became one of the representatives of Venezuela in the senate. An attempt was made in the house of representatives in 1826 to impeach him, whereupon he organ-

ized a revolt, which continued till Bolivar recognized him as the commander in Venezuela. In 1831, and again in 1839, he was elected president of Venezuela. Monagas, who succeeded him in 1846, attempted to make himself dictator and was opposed by Paez, who was defeated and captured. Released, but banished, he spent the years 1850–58 in New York. On the overthrow of Monagas in 1858 he returned to Venezuela. He was Venezuelan minister at Washington 1860–61, when he resigned, and, returning to Venezuela, was appointed dictator. Failing to restore order he returned to New York in 1864. He subsequently lived in Peru and the Argentine Republic.

PÆS'TUM, anciently a Greek city of Lucania, in s. Italy, in the present province of Salerno, on the *Sinus Pæstanus*, now the gulf of Salerno, and not far from mount Alburnus. It was founded by the Trœzenians and the Sybarites, some time between 650 and 610 B.C., and was originally called Poseidonia (of which *Pæstum* is believed to be a Latin corruption), in honor of Poseidon (Neptune). It was subdued by the Samnites of Lucania, and slowly declined in prosperity after it fell into the hands of the Romans, who established a colony here about 273 B.C. The Latin poets celebrate the beauty and fragrance of its flowers, and particularly of its roses, which bloomed twice a year. Wild roses, it is said, still grow among its ruins, which retain their ancient property, and flower regularly both in May and November. Pæstum was burned by the Saracens in the 10th c., and there is now only a small village called Pesto, in a marshy, unhealthy, and desolate district; but the ancient greatness of the city is indicated by the ruins of temples and other buildings. These appear to have been first noticed in the early part of the 18th c., by a certain count Gazola, in the service of the king of Naples; they were next described by Antonini, in a work on the topography of Lucania (1745), and have since been visited by travelers from all parts of Europe.

PAGA'NI, an uninteresting t. of s. Italy, province of Salerno. In the church of St. Michele, is the tomb of Alfonso de' Liguori, founder of the order of the redemptionists, who died here, 1787. The body is preserved in a glass case. Pop. about 13,300.

PAGANINI, NICOLO, a famous violinist, son of a commission-broker at Genoa, where he was born in 1782. His musical talent showed itself in his childhood; in his ninth year he had instructions from Costa at Genoa, and afterward from Rolla at Parma, and from Ghiretti. In 1801 he began his professional tours in Italy; in 1828 he created a great sensation on appearing for the first time in the principal towns of Germany; and in 1831 his violin-playing created an equal *furore* in Paris and London. His mastery over the violin has never been equaled, but he was too much addicted to using it in mere feats of musical legerdemain, such as his celebrated performance on a single string. His execution on the guitar was also very remarkable; for four years he made that instrument his constant study. Paganini died at Nice in 1840, leaving a large fortune.

PA'GANISM, another name for heathenism or polytheism. The word is derived from the Latin *paganus*, a designation of the inhabitants of the country (*pagus*), in contradistinction to the inhabitants of towns, the more educated and civilized inhabitants of towns having been the first generally to embrace Christianity, whilst the old polytheism lingered more in remote rural districts.

PAGE (derivation variously assigned to Gr. *pais*, a boy, and Lat. *pagus*, a village), a youth employed in the service of a royal or noble personage. The practice of employing youths of noble birth in personal attendance on the sovereign, existed in early times among the Persians, and was revived in the middle ages under feudal and chivalric usages. The young nobleman passed in courts and castles through the degree of page, preparatory to being admitted to the further degrees of esquire and knight. The practice of educating the higher nobility as pages at court, began to decline after the 15th c., till pages became what they are now, mere relics of feudal usages. Four pages of honor, who are personal attendants of the sovereign, form part of the state of the British court. They receive a salary of $1000 a year each, and on attaining a suitable age, receive from her majesty a commission in the foot guards.

PAGE, a co. in s.w. Iowa, having the state line of Missouri for its s. boundary; 528 sq. m.; pop. '90, 21,341, chiefly of American birth, with colored. It is intersected by the Chicago, Burlington, and Quincy and the Humeston and Shenandoah railroads. It is drained by the Nodaway, Takio, and e. Nishnabatona rivers, affluents of the Missouri. Its surface is mostly hilly, equally divided into prairie and woodland. The soil of the valleys which follow the water-courses is fertile, and is adapted to the production of grain and the raising of stock. Co. seat, Clarinda.

PAGE, a co. in n. Virginia, having a range of the Blue Ridge for its e. boundary, the Massanuttar mts. on the west; 288 sq. m.; pop. '90, 13,092, chiefly of American birth, with colored. It is drained by the south fork of the Shenandoah river intersecting it centrally. Its surface consists of a valley at the Blue Ridge. Timber grows on the uplands, which also furnish excellent pasturage. Its soil is calcareous and very productive, adapted to the production of grain and tobacco, and the raising of live stock. Its mineral products are copper, iron, and marble. It has blast furnaces and forges for the manufacture of iron; other industries are the manufacture of woolen goods, and distilled liquors. At Luray is an immense cave. Co. seat, Luray.

PAGE, JOHN, 1744–1808; b. Rosewell, Va., a graduate of William and Mary college, Williamsburg, Va., class of 1763; represented the college in the house of burgesses, and became a member of the colonial council. During the revolutionary war he was an ardent supporter of the cause of the colonists, contributing of his private means for its support, and was a leader of his party in his native state, of which he was elected lieutenant-governor, and held other offices in the gift of the people. He was a member of the convention which framed the constitution of Virginia, at one time was colonel of a militia regiment, was appointed one of the first councilors, and member of the committee of public safety. He was contemporary with Thomas Jefferson, with whom he sustained very friendly relations. He was member of congress 1789–97, and presidential elector in 1800. In 1802–5 he was governor of Virginia.

PAGE, THOMAS NELSON, American author, b. Hanover co., Va., April 23, 1853, studied at Washington and Lee university, and later studied law. He has written a number of stories in the negro dialect which have proved very popular. Among them are, *In Ole Virginia, or Marse Chan and Other Stories* (1887), *Two Little Confederates* (1888), *On Newfound River* (1890), *The Old South* (Essays, 1892), and *Meh Lady* (1892).

PAGE, WILLIAM, born Albany, N. Y., 1811; at the age of nine years went to New York with his parents, studied drawing, and four years afterward received a premium from the American institute for a drawing in India ink. In 1825 he commenced the study of law in the office of Fredrick De Peyster, but left it to learn the art of portrait painting of Herring, with whom he remained a year, and afterward entered the studio of Samuel F. B. Morse, artist, sculptor, inventor of the telegraph, and author of a portrait of Lafayette in the New York city hall, who, in connection with other artists, organized a drawing-school which resulted in the establishment, in 1826, of the national academy of design. By the influence of Mr. Morse he was admitted as a student at the academy, and for his drawings from the antique was awarded a large silver medal. In 1828 he joined the Presbyterian church, and removing to Andover, Mass., began the study of theology, and went from there to Amherst, in that state, intending to fit himself for the ministry, but returned to his artist life in 1830. He passed a year in Albany painting portraits, and was considered a painter of great promise, excelling in brilliancy of color and accuracy of drawing. Returning to New York he was admitted as a member of the national academy. Among his most valued works are a portrait of Gov. Marcy in the New York city hall, that of John Quincy Adams in Faneuil Hall, Boston : "The Holy Family" in the Boston Athenæum, "The Wife's Last Visit to her Condemned Husband," and "The Infancy of Henri IV." In 1844 he established himself in Boston and industriously followed his profession. In 1847–49 he resided in New York, and in the latter year went abroad, living 11 years in Italy ; studying in Rome and Florence. He is said to have made such literal copies of Titian that they were mistaken for the originals even by the residents of Florence. While in Italy he painted the portraits of several distinguished Englishmen and American tourists and residents abroad, and among his productions of that period are his two Venuses, "Moses and Aaron on Mount Horeb," "The Flight into Egypt," and "The Infant Bacchus." In 1860 he returned to the United States and took up his residence in Eagleswood, near Perth Amboy, N. J., after a time building a house on Staten Island, and painting in his studio in New York. Page delivered several courses of lectures on art, and in 1870 painted a portrait of Christ, which was placed on exhibition, and was the subject of considerable critical controversy. He was president of the academy of design in 1871–73. From photographs of the Kesselstadt mask of Shakespeare, preserved in Germany, he produced a bust of the poet, making the journey to that country for the purpose, and painted portraits from it. Among recent portraits are those of Henry Ward Beecher, Charles A. Dana, Parke Godwin, Wendell Phillips, and, about 1876, a full-length representation of "Farragut at the Battle of Mobile," which was presented to the late emperor of Russia by a committee who purchased it. He d. 1885.

PAGET, FAMILY OF. This noble family, though said to be of Norman extraction, do not trace their descent further back than the reign of Henry VII., in whose time one William Paget held the office of one of the sergeants-at-mace of the city of London. His son William, who was educated at St. Paul's school, and at Cambridge, was introduced into public life by Stephen Gardiner, bishop of Winchester, early in the reign of Henry VIII., who sent him abroad to obtain the opinions of foreign doctors as to his contemplated divorce from Catharine of Aragon. From this time forth his rise was rapid, and he was constantly employed in diplomatic missions until the death of the king, who appointed him one of his executors. He now adhered to the party of the protector Somerset, and was raised to the peerage in 1552, as lord Paget of Beaudesert. He shared in the power, and also in the fall, of the protector, and was heavily fined by the star chamber, who also deprived him of the insignia of the order of the garter. His disgrace, however, was not of long continuance, and a change taking place in the councils of his opponents, he soon obtained his pardon. On the accession of queen Mary, he was sworn a member of the privy council, and obtained several large grants of lands. He retired from public life on the accession of Elizabeth, who regarded him with much favor, though he was a strict Roman Catholic. The representative of the family adhered to the cause of Mary queen of Scots, and suffered, in consequence, the confiscation of his property. The fifth lord Paget so far departed from the traditionary policy of the family as

to accept from the parliament the lord-lieutenancy of Buckinghamshire; but he returned to his allegiance shortly afterward, and held the command of a regiment under the royal standard at the battle of Edgehill. His grandson was advanced to the earldom of Uxbridge, but this title becoming extinct, the representation of the family devolved on a female, who carried the barony of Paget by marriage into the house of Bayly. The son of this marriage, however, having assumed the name of Paget, obtained a renewal of the earldom of Uxbridge, and the second earl, for his gallantry at Waterloo, was advanced to the marquisate of Anglesey. Of late years, the Paget family have usually held three or four seats in every parliament, and they have constantly supported the liberal party.

PAGET, Sir James, D.C.L., b. England, 1814; became a member of the Royal College of Surgeons in 1836, and an honorary fellow in 1843. He is a member of the senate of the university of London, and of the council of the College of Surgeons. He was made a baronet in 1871, and elected president of the College of Surgeons in 1875. He is consulting surgeon to St. Bartholomew's hospital, and surgeon to the prince of Wales and the queen. He has published *Pathological Catalogue of the Museum of the College of Surgeons*, *Report on the Results of the Use of the Microscope*, and *Lectures on Surgical Pathology*.

PAGET, Violet, b. England, abt. 1857. She has resided in Italy since 1871, and devotes herself to literature—writing generally under the name of Vernon Lee—and to the care of an invalid half-brother, Eugene Hamilton, somewhat known as a poet. She contributes to the leading English periodicals, and has published *Studies of the 18th Century in Italy*, 1880; *Belcaro*, a vol. of essays on æsthetical subjects, 1882; *The Prince of a Hundred Soups*, 1883; *Ottilie, an 18th Century Idyl; Euphorion*, a collection of essays, *The Countess of Albany*, a biography, 1884, and *Miss Brown*, a novel, 1885. Though young, she is a writer of great force and originality, whose work reveals extensive and varied knowledge.

PAG'ING-MACHINE. Several machines have been made for paging books and numbering bank-notes, checks, railway tickets, and other similar papers. The great object of these machines is to prevent the chance of error or fraud by making it impossible that a page, check, etc., can be abstracted or lost without detection. Some years ago, an English firm perfected an ingenious machine, by which pages of books, such as ledgers and other commercial books, and bank-notes, etc., are numbered in regular succession. The numbers are engraved on metal rowels, usually of steel or brass. A series of these rowels are so arranged, that when the machine is worked, the numbers must be impressed on the paper in regular succession from 1 to 99,999; and it is impossible to produce a duplicate number until the whole series has been printed. The instrument is make to supply ink to the types, so that it may be locked in such a manner as to admit of being worked without the chance of its being tampered with.

An extremely ingenious modification of this machine has been perfected by M. Auguste Trouillet, of Paris, under the name of *Numérateur Mécanique*, which is not only more simple, but admits of wider application; for it not only pages books and numbers notes, tickets, etc., but can also be used for numbering bales and other packages of merchandise. The instrument has six rowels, on each of which is a set of engraved numbers, so arranged, that their revolutions produce in regular succession the required numbers, by the action of a lever which moves horizontally, and supplies the type with ink as it moves backward and forward.

PA'GO, an island belonging to the Austrian crownland of Dalmatia, separated from Croatia by the Morlacca canal, a channel from two to three miles in width. It is long and narrow, runs parallel to the Croatian coast, and has an area of 111 sq. m. Pop. '90, 6203, who are most industrious, and support themselves by vine-culture, the manufacture of salt and fishing.

PAGO'DA (according to some, a corruption of the Sanskrit word *bhâgavata*, from *bhagavat*, sacred; but according to others a corruption of *put-gada*, from the Persian *put*, idol, and *gada*, house) is the name of certain Hindu temples which are amongst the most remarkable monuments of Hindu architecture. Though the word itself designates but the temple where the deity—especially S'iva and his consort Durgâ, or Pârvatî—was worshiped, a pagoda is in reality an aggregate of various monuments, which, in their totality, constitute the holy place sacred to the god. Sanctuaries, porches, colonnades, gateways, walls, tanks, etc., are generally combined for this purpose, according to a plan which is more or less uniform. Several series of walls form an inclosure; between them are alleys, habitations for the priests, etc., and the interior is occupied by the temple itself, with buildings for the pilgrims, tanks, porticoes, and open colonnades. The walls have, at their openings, *gopuras*, or large pyramidal gateways, higher than themselves, and so constructed that the gopura of the outer wall is always higher than that of the succeeding inner wall, the pagoda itself being smaller than the smallest gopura. The extent of the inclosing walls is generally considerable; in most instances they consist of hewn stones of colossal dimensions, placed upon one another without mortar or cement, but with such admirable accuracy that their joints are scarcely visible. The gateways are pyramidal buildings of the most elaborate workmanship; they consist of several, sometimes as many as fifteen stories. The pagodas themselves, too, are of a pyramidal shape, various layers of stones having been piled upon one another in suc-

cessive recession; in some pagodas, however, the pyramidal form begins only with the higher stories, the broad basis extending to about a third of the height of the whole building. The sides of the different terraces are vertical, but the transition from one to the other is effected by a vault surmounted by a series of small cupolas, which hide the vault itself. A single cupola, hewn out of the stone, and surmounted by a globe, generally crowns the whole structure; but sometimes the latter also ends in fantastical spires of a fanlike shape or concave roofs. The pagodas are covered all over with the richest ornamentation. The pilasters and columns, which take a prominent rank in the ornamental portion of these temples, show the greatest variety of forms; some pagodas are also overlaid with strips of copper, having the appearance of gold. The most celebrated pagodas on the main-land of India are those of Mathura, Trichinopoli, Chalambron, Konjeveram, Juggernaut, and Deogur, near Ellora.—That of Mathura consists of four stories, and is about 63 ft. high; its base comprises about 40 sq. feet. Its first story is made of hewn stones, copper, and covered with gilt; the others of brick. A great number of figures, especially representing deities, tigers, and elephants, cover the building.—The pagoda of Tanjore is the most beautiful monument of this kind in the s. of India; its height is 200 ft., and the width of its basis is equal to two-thirds of its height.—The pagoda of Trichinopoli is erected on a hill, elevated about 300 ft. over the plain; it differs in style from other pagodas dedicated to Brahmanical worship, and exhibits great similarity with the Buddhistic monuments of Thibet.—The great pagoda of Chalambron, in Tanjore, is one of the most celebrated and one of the most sacred of India. It is dedicated to S'iva and Pârvatî, and filled with representations belonging to the mythical history of these gods. The buildings of which this pagoda is composed cover an oblong square 360 ft. long and 210 ft. wide.—At Konjeveram there are two pagodas—the one dedicated to S'iva and the other to Pârvatî.—The pagodas of Juggernaut, on the n. end of the coast of Coromandel, are three; they are erected likewise in honor of S'iva, and are surrounded by a wall of black stones—whence they are called by Europeans the Black Pagodas—measuring 1122 ft. in length, 696 ft. in width, and 24 ft. in height. The height of the principal of these three pagodas is said to be 344 ft.; according to some, however, it does not exceed 120 to 123 feet.—The pagoda of Deogur, near Ellora, consists also of three pagodas, sacred to S'iva; they have no sculptures, however, except a trident, the weapon of S'iva, which is visible on the top of one of these temples.—The monuments of Mavalipura, on the coast of Coromandel, are generally called the Seven Pagodas; but as these monuments—which are rather a whole city than merely temples—are buildings cut out of the living rock, they belong more properly to the rock-cut monuments of India than to the special class of Indian architecture comprised under the term pagoda.

The term pagoda is, in a loose way, also applied to those Chinese buildings of a tower form which consist of several stories, each story containing a single room, and being surrounded by a gallery covered with a protruding roof. These buildings, however, differ materially from the Hindu pagodas, not only so far as their style and exterior appearance are concerned, but inasmuch as they are buildings intended for other than religious purposes. The Chinese call them *ta*, and they are generally erected in commemoration of a celebrated personage or some remarkable event; and for this reason, too, on some elevated spot, where they may be conspicuous, and add to the charms of the scenery. Some of these buildings have a height of 160 ft.; the finest known specimen of them is the famous Porcelain Tower of Nanking (q.v.). The application of the name pagoda to a Chinese temple should be discountenanced, for, as a rule, a Chinese temple is an insignificant building, seldom more than two stories high, and built of wood; the exceptions are rare, and where they occur, as at Pekin, such temples, however magnificent, have no architectural affinity with a Hindu pagoda.

PAGU'RUS AND PAGU'RIDÆ. See HERMIT CRAB.

PAHANG, a state on the Malay peninsula, on the e. coast. Since 1888 it has been under British protection. It has an area of 10,156 sq. m. and a population (1891) of 57,462. It has gold, tin, and galena mines. It had a revenue (1891) of $106,744 and an expenditure of $231,914.

PAHLANPUR', a t. of India, capital of the state of the same name, 260 m. e.s.e. of Hyderabad. It is a walled t., is the seat of extensive trade and of several manufactures. Pop. '91, 21,100, many of whom are artificers and shopkeepers. The state of which Pahlanpur is capital lies between lat. 23° 57′ and 24° 41′ n., and long. 71° 51′ and 72° 45′ east. One-seventh of the population are Moslem and the remainder Hindus. The area of the state is about 3141; the state contains 300 villages; pop. 234,402. The products are wheat, rice, sugar-cane, and cotton. In the n. and w. the soil yields only one crop annually, but in the s. and e. three crops are obtained in the year.

PAHLAVI. See PEHLEVI.

PAIGE, ELBRIDGE GERRY, 1813–59; b. N. Y.; for some time the editor and proprietor of the N. Y. *Sunday Mercury*, in which he published a series of papers called *Short Patent Sermons*, by Lorenzo Dow, republished in 1854 in 3 vols. He was an unsuccessful business man. In 1849 he became one of the early California emigrants, and there died in great poverty.

PAILA is, according to the Purân'as (q. v.), one of the disciples of Vyâsa (q. v.), the reputed arranger of the Vedas (q. v.); he was taught by the latter the R'igveda, and, on his part, communicated this knowledge to Bâshkali and Indrapramati. This tradition, therefore, implies that Paila was one of the earliest compilers of the R'igveda.

PAILLERON, Édouard Jules Henri, dramatist; was b. in Paris in 1834. His works are largely ingenious satires upon the times, which have met with great popularity. He began life in a notary's office. In 1860 he published his first play, together with a volume of satirical poetry. Among his most successful subsequent productions are: *Le Dernier Quartier*, brought out at the Théâtre Français, 1863; *Le Second Monument*, produced at the Odéon; *Le Monde où l'on s'amuse*, at the Gymnase; *Les faux Ménages*; *Hélène*; *Petit Pluie*; *L'Étincelle*. *Le Monde où l'on s'ennuie*, produced at the Comédie Française, had an altogether unprecedented run and secured for M. Pailleron his election, in 1882, to the Académie Française.

PAIN is an undefinable sensation, of the nature of which all persons are conscious. It resides exclusively in the nervous system, but may originate from various sources. Irritation, or excessive excitement of the nervous system may produce it; it frequently precedes and accompanies inflammation; while it sometimes occurs in, and seems to be favored by a state of positive depression, as is seen in the intense pain which is often experienced in a limb benumbed with cold, in the pain which not unfrequently accompanies palsy, and in the well-known fact, that neuralgia is a common result of general debility. Hence, pain must on no account be regarded as a certain indication of inflammation, although it rarely happens that pain is not felt at some period or other in inflammatory diseases. Moreover, the pain that belongs to inflammation differs very much, according to the organ or tissue affected; the pain, for example, in inflammation of the lungs, differs altogether in character from that which occurs in inflammation of the bowels, and both these pains from that occurring in inflammation of the kidneys.

Pain differs not only in its character, which may be dull, sharp, aching, tearing, gnawing, stabbing, etc., but in its mode of occurrence; for example, it may be flying or persistent, intermittent, remittent, or continued. It is not always that the pain is felt in the spot where the cause of it exists. Thus, inflammation of the liver or diaphragm may cause pain in the right shoulder, the irritation caused by stone in the bladder produces pain at the outlet of the urinary passage; disease of the hip-joint occasions pain in the knee, disease of the heart is often accompanied with pain in the left arm, and irritation of the stomach often gives rise to headache. Pain is differently felt by persons of different constitutions and temperaments, some persons being little sensitive to painful impressions of any kind, while others suffer greatly from slight causes. There even seem to be national differences in this respect; and before the introduction of chloroform it was a matter of common observation that Irishmen were always more troublesome subjects for surgical operations than either Englishmen or Scotchmen; and the negro is probably less sensitive to pain than any of the white races.

Although in most cases we are to regard pain merely as a symptom to be removed only by means which remove the lesion which occasions it, there are cases in which, although it is only a symptom, it constitutes a chief element of disease, and one against which remedies must be specially directed. As examples of these cases, may be mentioned neuralgia, gastralgia, colic, dysmenorrhœa, and perforation of the intestines; and in a less degree, the stitch of pleurisy, which, if not relieved, impedes the respiration, and the pain of tenesmus, which often causes such efforts to empty the lower bowel, as seriously to disturb the functions of the intestine, and to exhaust the strength.

For the methods of relieving pain, the reader is referred to the articles on the different diseases in which it specially occurs (as Colic, Neuralgia, Pleurisy, etc.), and to those on Chloroform, Ether, Hemp, Indian, Morphia, Narcotics, Opium, etc.

PAINE, Charles, 1799–1853; b. Vt.: son of Dr. Elijah; graduated at Harvard college, 1820. He became engaged in various manufacturing enterprises, acquired considerable wealth, and became noted for his liberal assistance to the Vermont state university and Northfield academy. He was governor of Vermont, 1841–43.

PAINE, Elijah, ll.d., 1757–1842; b. Conn.; graduated at Harvard college, studied law and was admitted to practice in 1784. He was a member of the state legislature, 1787–91; judge of the state supreme court, 1791–95; was then elected U. S. senator, and at the close of his term of office, 1801, was appointed U. S. district judge for Vermont, a position which he held until his death. In 1782 he delivered the first Phi Beta Kappa oration at Harvard, and in 1789 was made president of that society. He was noted not only as a scholar, lawyer, and publicist, but also for his benevolence and his liberality to educational institutions. He was one of the first to undertake the manufacture of American cloth.

PAINE, John Knowles, American composer, b. in Portland, Me., Jan. 9, 1839. He was educated in Berlin, where he studied organ and counterpoint under Haupt, singing under Fischer, and instrumentation under Wieprecht. Returning to Boston in 1861 he settled there as an organist, and gave organ concerts in various cities. In 1862 he taught music at Harvard, and in 1876 was raised to full professor, and the first chair of music in an American university was created. This post he still holds. He is the first composer of America, and many of his works have been made popular by Thomas's orchestra. His early compositions are classic in style, and show much

knowledge of musical form, but his late compositions belong to the romantic school. These include : mass in D for chorus, soli, and orchestra, given under the composer's direction in Berlin, 1867 ; *Saint Peter*, oratorio, Portland, 1873 ; *Centennial Hymn*, text by Whittier, written for the opening of the Centennial Exhibition, May 10, 1876 ; music to *Œdipus Tyrannus*, of Sophocles, for male voices and orchestra, Cambridge, 1881 ; *The Realm of Fancy*, text by Keats, cantata for soprano solo, chorus, and orchestra, Boston, 1882 ; *Phœbus, arise*, text by Dryden, cantata for tenor solo, male chorus, and orchestra, 1882 ; *The Nativity*, text by Milton, cantata, Boston, 1883 ; *Song of Promise*, text by Woodberry, cantata written for the Cincinnati May Musical Festival, 1881 ; symphony in C minor, 1876 ; *Spring*, symphony, 1880 ; overture to *As You Like It*, 1878 ; overture to *The Tempest*, 1877 ; duo concertante for violin and violoncello, 1878 ; *An Island Fantasy*, symphonic poem, 1888 ; chamber and pianoforte music, songs and part songs, and compositions for the organ, including concert variations on the *Austrian Hymn* and the *Star-Spangled Banner*, the *Columbian March and Chorus* for the opening of the World's Columbian exposition at Chicago, etc.

PAINE, Robert, D.D.; b. N. C. in 1799; removed to Tennessee in 1813; in 1817 joined the Tennessee conference of the Methodist Episcopal church; president of La Grange college, Ala., 1830–46; and was then elected Bishop. He was chairman of the committee of nine appointed to prepare a plan for the division of the church; was a prominent member of the Louisville convention in 1845, which organized the Methodist Episcopal Church, South. Dr. P. was distinguished as a preacher and as presiding officer in the conference. He is the author of a work on *Hopkinsianism*, and the *Life and Times of Bishop McKendree*. He d. 1882.

PAINE, Robert Treat, 1731–1814; b. Boston, Mass.; son of Thomas, minister at Weymouth. He graduated at Harvard college in 1749, and after teaching school and making a tour in Europe, studied for the ministry. He was chaplain of the provincial troops in the north in 1755, and afterward studied law, and was admitted to the bar in 1759. He practiced law in Taunton for a number of years. In 1768 he was a delegate from that town to a convention called by prominent citizens after the legislature had been dissolved by Gov. Bernard for refusing to take back its circular letter to the other colonies. In 1770 he managed in the absence of the attorney-general the prosecution of Capt. Preston and his troops for the Boston massacre. In 1773–74 he was a member of the Massachusetts legislature. He was a representative of that state in the continental congress, 1774–78, and a signer of the declaration of independence. In 1776 he was a congressional commissioner from congress to Schuyler's army. He was speaker of the Massachusetts house of representatives in 1777, and was the first attorney-general of that state under the new constitution, which he had himself helped to frame. He continued to hold the office of attorney-general till 1790, when he accepted an appointment as an associate justice of the state supreme court. He resigned in 1804 on account of deafness. His last public office was that of councilor. He was an able lawyer, and a sound judge.

PAINE, Robert Treat, Jr., 1773–1811; son of Robert T. His name was originally Thomas, but was changed in 1801 to that of his father. Paine remarked upon the occasion of the change, and in allusion to the more famous Thomas Paine, that he now for the first time had a "Christian" name. He graduated at Harvard in 1792, and went into business. But he soon abandoned mercantile life, and began a bi-weekly literary paper called *The Federal Orrery*. About the same time he began to write theatrical criticisms. He wrote for the *Orrery* the *Lyars* and *The Jacobiniad*, which were full of personalities, and made him many enemies, and he was several times assaulted. In 1795 he married Miss Baker, an actress. The same year, upon taking the degree of A.M., he read a poem upon *The Invention of Letters*, for which he was paid $1500, and Washington wrote him a letter expressing a high opinion of its merit. He sold his newspaper in 1795, and the same year read a poem on *The Ruling Passion*, before the Harvard Phi Beta Kappa society; this poem he disposed of for $1200. In 1798 he composed the song called *Adams and Liberty*, for which he received $750.

PAINE, Thomas, an author famous for his connection with the American and French revolutions, and for his advocacy of infidel opinions, was b. Jan. 29, 1737, at Thetford, in the county of Norfolk in England. He was trained to the business of his father, who was a staymaker, but afterward obtained a situation in the customs, and the management of a tobacco-manufactory. His income, however, was small, and he fell into debt, and was dismissed in 1774, upon which he went to America; was favorably received by a book-seller in Philadelphia, and in 1776 published a pamphlet entitled *Common Sense*, written in a popular style, in which he maintained the cause of the colonies against the mother-country. The success and influence of this publication were extraordinary, and it won him the friendship of Washington, Franklin, and other distinguished American leaders. He was rewarded by congress with the appointment of secretary to the committee of foreign affairs; visited France in the summer of 1787, where he made the acquaintance of Buffon, Malesherbes, La Rochefoucauld, and other eminent men; and in the autumn following went to England, where, in 1791, he published *The Rights of Man*, the most famous of all the replies to Burke's *Reflections upon the French Revolution*.

The work has gone through innumerable editions, and has been translated into almost all the languages of Europe. His defense of the principles of the French revolution against the magnificent assault of Burke and the outcry of the English aristocracy is vigorous, and by no means unsuccessful. But the value or at least the popularity of the work has been injured by its advocacy of extreme liberal opinions. His assaults on the British constitution exposed him to a government prosecution, and he fled to France, where he was admitted to citizenship; and in 1792 the department of Pas-de-Calais elected him a deputy to the national convention, where he voted with the Girondists. At the trial of Louis XVI., says Madame de Staël, "Thomas Paine alone proposed what would have done honor to France if it had been accepted—the offer to the king of an asylum in America;" by which he offended the mountain party; and in 1793 Robespierre caused him to be ejected from the convention, on the ground of his being a foreigner, and thrown into prison. During his imprisonment he wrote *The Age of Reason*, against Atheism, and against Christianity, and in favor of Deism. After an imprisonment of 14 months he was released on the intercession of the American government, and restored to his seat in the convention. He was chosen by Napoleon to introduce a popular form of government into Britain, after *he* should have invaded and conquered the island. But as Napoleon did not carry out his design, Paine was deprived of an opportunity of playing the part of legislator for his conquered countrymen. He then retired into private life, and occupied himself with the study of finance. In 1802 he returned to the United States, and died June 8, 1809. The most complete edition of his works is that by J. P. Mendum (Bost., 1856); the most noted of his numerous biographers is William Cobbett.

PAINESVILLE, village and co. seat of Lake co., O.; on the Grand river and the Lake Shore and Michigan Southern, the New York, Chicago, and St. Louis, and the Pittsburg and Western railroads; 30 miles e. of Cleveland. It contains the Lake Erie female seminary, public and school libraries, waterworks supplied from Lake Erie, electric light and street railroad plants, grain elevator, flour mill, large file works, and machine shops. The city has extensive ore docks at Fairport, on Lake Erie. Pop. '90, 4,755.

PAINT, Luminous, a highly phosphorescent substance obtained from lime and sulphur in certain proportions, and patented by the late Mr. Balmain. Exposure to the light renders articles painted with this substance capable of retaining a distinct glow for a long time. The violet rays of light produce the most noticeable effect upon the paint, while the red and yellow rays do not increase the glow. It is said to be weatherproof and capable of resisting the action of the sea.

PAINTER, Gamaliel, 1743–1819; b. New Haven, Conn.; received his education at the public schools; the pioneer settler of Middlebury, Vt., erecting the first house in the town. He was also the founder of Middlebury college in that place, bequeathing $10,000 for that purpose. In the revolutionary war he served as captain of a company, and as quartermaster. In 1777 he was chosen delegate to the convention which declared the independence of the state of Vermont, and was representative from his district to the Vermont legislature in its earliest sessions. In 1793 he was a member of the constitutional convention of Vermont.

PAINTER'S CREAM, a composition used by artists to cover oil-paintings in progress, when they leave off their work; it prevents drying, and the consequent showing of lines where new work is begun. It consists of 6 parts of fine nut oil, and 1 part of gum-mastic. The mastic is dissolved in the oil, and then is added a quarter part of acetate, or sugar of lead, finely triturated with a few drops of the oil.

PAINTING, the art of representing objects to the eye on a flat surface by means of lines and color, with a view to convey ideas and awaken emotions. See Art. As one of the fine arts, painting occupies a prominent place; some claim for it the first place, as combining the chief elements—namely, form, light and shade, and color. As compared, however, with music and poetry, it lacks the important element of movement, the representation being confined, in a great measure, to one aspect and one instant of time. In its ruder and more elementary forms, in which the primary design was to communicate ideas, painting is perhaps the oldest of the arts, older, at all events, than writing (see Alphabet, Hieroglyphics); and, as a vehicle of knowledge, it possesses this advantage over writing—that no *description*, however minute, can convey so accurate and distinct an idea of an object as a pictorial representation, much less make so vivid an impression. Besides this, it is not limited, as writing is, by differences of language, but speaks alike to all nations and all ages.

The great antiquity of painting is proved by remains discovered in Egypt, and by reference to it in ancient writings. It has been ascertained that as early as the 19th c. B.C., the walls and temples of Thebes were decorated by painting and sculpture. Ezekiel, who prophesied about 598 years B.C., refers to paintings in Jerusalem after the manner of the Babylonians and Chaldeans. Though no specimens have come down to us, it is evident that paintings of the highest excellence were executed in Greece. This is proved by what is recorded of them, for the subjects of many of those mentioned required the putting forth in a high degree of all the qualities requisite for the production of the greatest historical works, such as form, grouping, expression, fore-shortening. From the immense sums given for paintings, the care with which they were preserved in temples and other public buildings, and from the fact of the high state of sculpture at

contemporary periods, as proved by well-known works now extant, it may be deduced that painting, which, like sculpture, is based on design or drawing, must have occupied an equally high position. Even the imperfect specimens of painting discovered in Pompeii, where the style and influence of Greek art may be traced to some extent, lead to conclusions highly favorable to the high position of painting in classic times. The chief schools of painting in Greece were those of Sicyon, Corinth, Athens and Rhodes. The first great artist of whose works there is any authentic description, and from details of which an idea may be formed of his attainments, is Polygnotus of Thasos (flor. 420 B.C.), who painted, among other works, those in the Pœcile, a celebrated portico at Athens, and the Lesche, or public hall at Delphi.

The works of Apollodorus of Athens (flor. 408 B.C.) are described and highly praised by Pliny. Zeuxis, the pupil of Apollodorus, Eupompus, Androcides, Parrhasius (q.v.) the Ephesian, and Timanthes of Sicyon, prosecuted painting with distinguished success, and by them it was carried down to the time of Philip, the father of Alexander. Of the same period was Pamphilus, celebrated not only for his works, but as the master of the artist universally acknowledged as the greatest of the ancient painters, Apelles (q.v.), who was born probably at Colophon, and flourished in the lattter half of the 4th c. B.C. He was highly esteemed by Alexander the great, and executed many important works for that monarch. Protogenes of Rhodes was a contemporary, and may be styled the rival of Apelles, who greatly admired his works. His picture of Ialysus the hunter and the nymph Rhodes was preserved for many years in the temple of Peace at Rome. Art in Greece had now reached its highest point; its course afterwards was downwards.

In Italy art was followed at a very early period by the Etruscans, and, according to Pliny, painting, as well as sculpture, was successfully practiced in Ardea and Lanuvium, cities of Latium, perhaps more ancient than Rome. The finest specimens of Etruscan art, however—as the paintings on tombs, and the remains of armor and fictile ware ornamented with figures, evince unmistakably the influence of, or rather are identical with Greek art. According to Pliny it was introduced from Corinth about 650 B.C. No great national school of painting ever flourished in Rome, for though the names of Romans who were painters are cited, the principal works of art that adorned the temples and palaces of Rome were obtained from Greece, and it is probable that many of the paintings executed there were by Greek artists. When the seat of empire was transferred to the east, such art as then remained was carried with it, and in a new phase was afterwards recognized as Byzantine art—a conventional style, in which certain typical forms were adopted and continually repeated. This mode has been preserved, and is practiced in church-painting in Russia at this present time.

Much discussion has arisen in modern times as to the supposed technical modes or processes of painting employed by the ancients. It seems established that painting in freso was much practiced; but many of the most valuable pictures we read of were removable, and there are accounts of some carrried from Greece to Rome. "The Greeks preferred movable pictures, which could be taken away in case of fire" (*Wilkinson on Egyptian and Greek Paintings*), and Pliny says Apelles never painted on walls; therefore, there can be no doubt that the ancients painted on boards; indeed, the name *tabula* or *tabula picta* proves this, and it seems to be now generally acknowledged that these were executed in tempora—that is, with size, and probably fixed or protected by some kind of varnish, in the preparation of which oil was used; or in encaustic, a process in which wax was employed to fix and give brilliancy and depth to the colors, heat being applied in working with it.

Painting was revived in Europe in the 13th c.; previous to that period, Byzantine artists chiefly were employed. On the conquest of Constantinople by the Latins in 1204, the Byzantine school was broken up, and many Greek artists were transplanted to Italy, where art was now destined to flourish, so the works of the Italians who profited by their instructions, were necessarily, at the commencement, composed in the Byzantine style. The first Italian whose name is associated with the revival of Italian art is Guido of Sienna; a work by him, a large Madonna, inscribed with his name and the date 1221, is still preserved in that city. The next is Giunta Pisano (1236). But Giovanni Cimabue (q.v.), 1240–1300), is commonly styled the founder of the Italian school. Several works of considerable importance are ascribed to him; and though he followed the Byzantine arrangement, he ventured occasionally out of the path, introduced the study of nature in his drawing, and imparted a greater degree of softness to his painting than the Byzantine artists. The influence of Byzantine art was not confined to Italy: it operated in Germany, Bohemia, and France; but there also art began to assume a national character early in the 13th c., and paintings are still preserved at Cologne, dated 1224. The Italian school of painting, or that style in which so many of the highest qualities of art have been so successfully carried out, received its chief impetus from Giotto (q.v.), the son of Bordone, born in 1276 at Vespignano, near Florence, where he died in 1336. It is said that he was originally a shepherd-boy, and being discovered by Cimabue drawing a sheep on a slate, was instructed by him in painting. His style is distinguished from that of earlier painters by the introduction of natural incidents and impressions, by greater richness and variety of composition, by the dramatic interest of his groups, and by total disregard of the typical forms and conventional style of his predecessors. His influence was not confined to Florence, but extended over the whole of Italy: and works by this artist may be traced from Padua to Naples. Giotto followed Pope Clement V. to Avignon, and is said to have executed many important pictures there, and in other cities

in France. The most celebrated of his frescoes now extant are those at Assisi; some noted works by him in that class also remain at Padua, Florence, and Naples. Most of the small easel-pictures ascribed to him are of doubtful authenticity, but some preserved in the gallery at Florence are acknowledged to be genuine. His high powers as a sculptor and architect are also exemplified by works in that city. Giotto had numerous scholars and imitators, and several of these have left works which show that while they profited by his instruction or example, they were also gifted with original talent. Among these may be noticed Taddeo Gaddi, the favorite pupil of Giotto (born 1300, living in 1352); Simone Memmi (1284–1344); and Andrea Orcagna (1329–89), one of the artists employed in the decoration of the celebrated Campo Santo at Pisa. Painting in Italy continued to be impressed with the feeling and style of Giotto for upwards of a hundred years; but early in the 15th c. the frescoes executed by Masaccio (1401–43) in the Brancacci chapel in the Carmelite church at Florence, clearly prove that it had entered on a new phase, and had come forth strengthened by an important element in which it formerly was deficient, viz., correct delineation of form, guided by the study of nature. These celebrated frescoes, twelve in number, were at one time all ascribed to Masaccio; but it seems now to be acknowledged by judges of art that two of these are by Masolino da Panicale (1378–1415), the master of Masaccio; and three, or probably four, and a small portion of one, by Filippino Lippi (1460–1505). The frescoes by Masaccio, however, are superior to those by Masolino and Lippi, and, indeed, for many of the highest qualities in art, have, as compositions, only been surpassed by Raphael in his celebrated cartoons. In about a century from Masaccio's time, painting in Italy attained its highest development; but before referring to those artists who are acknowledged as having carried painting to the highest elevation it has attained since the period of the middle ages, it is right to note the names of some of the painters who aided in raising it to that position. The works of Fra Giovanni da Fiesole (1387–1455) are highly valued and esteemed by many critics as the purest in point of style and feeling, and so the best fitted for devotional purposes. Confining his efforts to simple and graceful action, and sweet and tender expression, he adhered to the traditional types, and ventured on none of the bold innovations which were introduced in his time, and carried so far by Masaccio. His example, as regards feeling and expression, influenced many succeeding artists, particularly Pietro Perugino, the master of Raphael (1446–1524), and Francesco Francia of Bologna (1450 or 1453–1517), by both of whom these qualities, united to greatly improved technical power, were brought to high excellence. Giovanni Bellini, the founder of the early Venetian school (1422–1512), has left many admirable works; he had numerous scholars, among them Titian and Giorgione. Domenico Corradi or Ghirlandajo, under whom Michael Angelo studied, successfully followed out that direction given to art by Masaccio, which involved individuality of character and expression in the figures. Andrea Mantegna, of the school of Padua (1430–1506), along with strong expression, gave an impetus to form, modeled on Greek or classic art. Luca Signorelli of Cortona (about 1440–1521), successfully exemplified powerful action and bold foreshortening, particularly in his frescoes at Orvieto, which, with his other works, are supposed to have strongly influenced the style of Michael Angelo. Antonello da Messina (1447–96) is said to have been a pupil of Jan Van Eyck, who imparted to him his secret in the preparation and use of oil-colors, the knowledge of which he spread among the Venetians. The above statement, however, as to the exact period at which oil-painting was first introduced, is one attended with much doubt. Painting with colors mixed in oil is mentioned by Italian writers before the period of Van Eyck; painting in tempera, or size, was continued in Italy, particularly in the Florentine and Roman schools, to the time of Raphael; and the transition from the one method to the other has been so gradual, that many judges of art have expressed inability to determine whether the pictures of Perugino, Francia, and Raphael are in oil or tempera, or in both. The practice of painting on canvas, in place of wooden boards or panels, was introduced and carried on for a considerable time in Venice before it was adopted in other parts of Italy, and canvas is the material best suited for pictures in oil-colors when they are not of small dimensions; so, on the whole, the conclusion seems to be, that though oil-painting was not unknown in Florence and the south of Italy, painting in tempera was longer practiced there than in Venice. At the time when the painters above referred to flourished, there were many able artists in Germany, whose works are deservedly very highly prized. Among these, Jan Van Eyck (q.v.), (about 1390–1441), deserves special notice. To him is generally given the credit of being the first painter who used oil in place of size in his colors. His works are remarkable for brilliant and transparent coloring and high finish. He had numerous scholars; among these, Justus of Ghent (flor. 1451), Hugo Vander Goes (died 1480)—supposed to be the painter of the celebrated wings of an altar-piece, now at Holyrood palace, containing portraits of James III. and his queen—Roger of Bruges (1365–1418), Hans Hemling or Memling (died 1489), the best scholar of the Van Eyck school; Quintin Matsys (1450–1529), Jan Van Mabuse (1470–1532), Albert Dürer (q.v.), (1471–1528), Lucas Van Leyden (q.v.), (1494–1533). The career of the two last-named extended to the best period of art, and for many high qualities their works strongly compete with those of the ablest of the Italians; while portraits by Hans Holbein (q.v.), (1497–1554), and Antonio More (1512–88) rank with those of any school or period. The leading qualities in German art are invention, individuality of character, clearness of coloring, and high finish; but they are

1

3

PAINTING (MODERN).—1. Sylvia (Perugini). 2. The Three Fates (Thurmann). 3.

2

4

5

Summer Moon (Sir F. Leighton). 4. Ashes of Roses (Boughton). 5. Portrait (Sir Joshua
olds).

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inferior to the Italians in embodying beauty; their representation of the nude is angular in form and deficient in the elegance and grace attained by the painters of Italy; and in their draperies they do not attain the simplicity and grandeur so remarkable in the works of their southern competitors.

Anything like an account of the artists by whom painting was carried to its highest pitch, of sufficient comprehensiveness to exhibit their peculiar æsthetic qualities, cannot be attempted in so short a notice as this; but that deficiency is in some degree supplied by, and reference is made to, the biographical notices of distinguished painters given in this work under their names. Keeping this reference in view, therefore, the next step is to note the relative positions generally assigned to the most distinguished painters of that period, with reference to the estimation in which their works are now held. Leonardo da Vinci (q.v.), (1452–1519), Michael Angelo Buonarotti (1474–1563), and Raphael or Raffaello Sanzio of Urbino (1483–1520), are universally acknowledged as the three greatest among the Italian artists; but two other names may be added as worthy to be put in an equally high place—those of Titian (q.v.), (1477–1576), and Antonio Allegri, surnamed Correggio (q.v.), (1494–1534). These five painters exhibit in their works, some of them the whole, others the greater portion of the various elements —which in the earlier periods of art had existed apart, and composed distinct styles— united, and more highly developed; while each of them has taken up one of these elements, and carried it not only further than his predecessors had done, but further than it was by his contemporaries, or by any subsequent artist. Thus we see in Leonardo's celebrated picture of the "Last Supper," that though he has adopted the traditional style of composition handed down from Giotto's time, and carried out the religious feeling and dignified expression aimed at by the older masters, the whole is deepened and elevated by the manner in which it is worked out—namely, by a mind and hand possessing mastery over all the elements that are combined in the production of the highest works of art. Michael Angelo was a proficient in all the qualities that constitute a painter, but he carried several of them—viz., grandeur of design, anatomical knowledge, and power of drawing—far beyond all other artists of his own or of later times. Titian and Correggio, again, with great power over every art-element, have each carried one quality further than all other artists—the former, color; the latter, light and shade. Raphael is generally allowed the first place among painters, for, though each of the four artists just referred to carried one, or perhaps two, of the qualities of painting further than he did, he excelled them in every other element but the one for which each was particularly distinguished, and in several of the highest qualities of art he attained to greater excellence than any other artist; the expression of dignity of movement by broad masses and grand lines aimed at in the works of Masaccio, is successfully realized in the cartoons at Hampton court; and the pictures in which Perugino and Francia so earnestly and successfully embodied female beauty, maternal affection, and infantine purity, are as much inferior to pictures of similar subjects by Raphael as they are above those executed during the decadence of Italian art. Besides the five leading masters just referred to, there were many other Italian artists of great talent, who may be ranged in three classes: 1, the contemporaries of those artists; 2, those influenced by their style; 3, their scholars. Among their contemporaries, the works of Fra Bartolommeo (1469–1517) and Andrea Vanucchi, called Andrea del Sarto (1488–1530), both Florentines, deservedly rank very high. Giorgio Barbarelli, called Giorgione (1478–1511), was, under Bellini, a fellow-pupil of, and is generally styled the rival of Titian; and his works, which are of great excellence, prove that he was worthy of that name. In class 2, Correggio himself may rank as being influenced by Leonardo's style, but the great prominence of his other qualities makes his style original and independent. On Bernardino Luini (about 1460, living in 1530), Leonardo's influence is direct; and as he was an able painter, his pictures are very valuable for embodying many of those qualities in art which Leonardo had so much improved. Sebastiano del Piombo, a Venetian (1485–1547), studied under Giovanni Bellini and Giorgione; and after settling in Rome, became intimate with Michael Angelo, who employed him to paint some of his designs, with a view of benefiting by his admirable coloring. His pictures are greatly esteemed, as uniting rich color to grandeur of design. Class 3. All the five leading artists above referred to had pupils or scholars, particularly such of them as, like Raphael, were much engaged in extensive works in fresco, in the execution of which assistants are generally employed. A complete list of these, however, would occupy too much space here. Among the scholars of Michael Angelo, Daniele da Volterra (1509–66) was the best; and among Raphael's scholars, the first place is generally accorded to Giulio Romano (q.v.) or Pippi (1492–1546). After the first quarter of the 16th c., painting in Italy, except in the Venetian school, showed symptoms of rapid decline; that school, however, continued its vitality longer than any other in Italy, having flourished with all the life of originality during the whole 16th century. This is attested by the productions of many able Venetian painters; but among those, the works of Jacopo Robusti, or Tintoretto (q.v.), (1512–94), and Paolo Cagliari (q.v.), or Veronese (1528–88), are by far the most important. The pictures of the former exhibit great vigor in composition, and much richness of color— the former quality evincing the influence of Michael Angelo; the latter, that of Titian. Veronese ranks before even Tintoretto; his compositions are animated and full, and as a colorist he is a powerful rival to Titian, not aiming at the rich glow of that master's

tints, but excelling every artist in producing the brilliancy and sparkling effect of mid-daylight on figures gorgeously attired, and seen against backgrounds enriched with landscape and architecture. The other great schools of Italy, however, as already said, had less vitality than the Venetian, and showed symptoms of decay at the end of the first quarter of the 16th century. Raphael left numerous scholars and assistants; many of these, after his death in 1520, quitted Rome. The pillage of that city by the French under Bourbon in 1527 had also the effect of dispersing them, and this naturally led to the style of Raphael, so far as they could acquire it, being transplanted into other parts of Italy; but Raphael's style was founded on his own peculiar feeling for the beautiful, and on his own peculiar grace; and all that his scholars had acquired or could convey was a mere imitation of his external forms, without the spirit and pure feeling of which these forms are the expression. The imitation of Michael Angelo became the great object with the Florentines; but his scholars and imitators being unable to comprehend his powerful spirit, and not possessing his technical powers and theoretical knowledge, their pictures are merely exaggerated compositions of academic figures. Nor were Correggio's scholars more successful in following his walk, for they exaggerated the peculiarities of his style, which in their hands became affected and insipid. Leonardo's scholars repeated his distinguishing qualities, modified by their own individual peculiarities, and avoided that academic ostentation displayed by the followers of the masters just named. Their reputation therefore stands higher.

The German painters who succeeded Dürer, Van Leyden, and the other celebrated artists of their period, before referred to, endeavored to improve their national style by the study of Italian art, at first attempting to combine the two styles, and afterwards, to the close of the 16th c., devoting themselves exclusively to the study or imitation of the Italian painters. The works of these artists, the worst productions of any school, form a connecting link between those of the famous old German masters and the vigorous, varied, and attractive works of the painters of the Netherlands in the 17th century.

Towards the end of the 16th, and during the first half of the 17th c., a revival of art in Italy was attempted. This was sought for in two ways by two classes of artists; the larger body were known by the name of eclectics, from their having endeavored to select and unite the best qualities of each of the great masters, combined with the study of nature; the other class were distinguished by the name of naturalisti, and they aimed at forming an independent style, distinct from that of the earlier masters, based on the indiscriminate imitation of common life, treated in a bold and lively manner. In their development, both classes exercised an influence on each other, particularly the naturalisti on the eclectics. Eclectic schools arose in various parts of Italy, but the most celebrated was that at Bologna, founded by Lodovico Carracci (1555–1619 and) his nephews, Agostino Carracci (1558–1602) and Annibale Carracci (1560–1609), the most eminent of the three. See Bolognese School. Many painters of mark were reared in this school; among those, Domenico Zampieri, called Domenichino (q.v.), (1581–1641) and Guido Reni (q.v.) (1575–1642) were by far the most eminent. The art of the eclectics has been greatly overrated. Till recently the leaders of that school were always placed on an equality with the best masters of the early part of the 16th c. and far above any of the painters of the 15th century. These notions have recently undergone a complete change; it is now acknowledged that the attempt of the eclectics to combine the excellences of various great masters involves misapprehension with regard to the conception and practice of art, for the greatness of the earlier masters was brought out in their individual and peculiar qualities, the uniting of which implies a contradiction. Michael Angelo Amerighi da Caravaggio (q.v.), (1569–1609) was the founder of the naturalisti school; he resided principally at Rome, but at a later period went to Naples, Malta, and Sicily. The naturalisti were in their greatest strength at Naples, where they perseveringly opposed the followers of the Carracci, their leader being Jose Ribera (q.v.), a Spaniard, hence called Spagnoletto (1593–1656). With much of the force of Caravaggio, he united more delicacy and greater vivacity of color. The historical or scriptural subjects of Salvator Rosa (q.v.), (1615–73) are in the style of the school of the naturalisti; but on account of his *genre* pieces and landscapes, Salvator is entitled to occupy the place of the originator of a style noted for certain qualities of poetic feeling. The influence of the school of the naturalisti had more important results than that of the eclectics, for it affected to some extent the leading masters of the Spanish school. At Rome, contemporaneously with Domenichino, Guido, and other leading masters of the schools of the eclectics and naturalisti, the three following artists elevated landscape-painting to a high position—Nicholas Poussin (q.v.), a Frenchman (1594–1665); Claude Gelée, also a native of France (1600–82), called Claude Lorraine (q.v.); and Gaspre Duchet, named Gaspar Poussin (q.v.), born in Rome, but the son of a Frenchman (1613–75). Among the great masters who occasionally practiced landscape-painting as a distinct branch of art, the earliest were Titian and Giorgione; the Carracci (particularly Annibale) carried out their style with considerable success; the landscapes of Domenichino are esteemed, and other scholars of the Carracci turned their attention in that direction. The reputation of N. Poussin is principally based on his figure-pictures, the subjects of which were mythological and scriptural. Into these pictures, he endeavored, with considerable success, to infuse the classical style; but his compositions were generally arranged with a large space of landscape background, which was in many cases not the least important

portion of the picture; and these, and the pictures he painted falling strictly under the class of landscapes, are distinguished for largeness of style and poetic feeling. Claude and Gaspar directed all their efforts to landscape, and attained to high eminence in that department of art.

The earlier specimens of painting in Spain resemble in style the works of the old German painters, who seemed to have disposed of many of the pictures in that country, while Spanish art of the 16th c. was modeled on that of Italy, Titian and Raphael being the masters studied; but when works of the Spanish school are spoken of, those executed in the 17th c. are always understood to be referred to, as it was then that Spanish art became entirely national in feeling and style, and that is the period in which the best works of the school were produced. The two most distinguished Spanish painters are Don Diego Velasquez (q.v.), (1599–1660), and Bartholomé Esteban Murillo (q.v.), (1618–82). The portraits of the former are characterized by truthful and dignified expression, great breadth and vigorous handling, and rank with the best works of that class of any school; while the Scripture subjects of the latter, which are noted for tender expression, rich color, and powerful light and shade, may be classed with similar works by Rubens and Van Dyck. Spagnoletto, a Spanish painter, has already been referred to as a leading artist of the school of the naturalisti at Naples. Alonzo Cano (1601–67), Francisco Zurbaran (1598–1662), and Claudio Coello (b. between 1630 and 1640, d. 1693), have a high reputation. No name of a Spanish painter of eminence occurs after the close of the 17th century.

Very soon after the period when the eclectic and naturalistic schools arose in Italy, a revival of art also occurred in the Netherlands. This was very different in its effects from the revival in Italy, the only results from which were academical imitation of the older masters, and coarse naturalism, either separately or combined in varied proportions; while the works of the artists of the Netherlands executed about the same period, though they do not exhibit the high qualities found in the compositions of the Italian masters of the best period, possess many new and attractive features—freedom, originality of treatment, attention to the peculiar character of individual life, and the daily intercourse of men with each other in all its variety, and the study of nature, brought out with truth and delicacy of execution. Two important schools of art were established by this movement—the Flemish and the Dutch. The Flemish school flourished in Brabant, where the Roman Catholic faith—then making strenuous efforts to oppose the reformed religion—still retained and actively employed art in its service. The Dutch school flourished in Protestant and republican Holland, where the artist, having to trust to private encouragement, painted, for the most part, familiar subjects from everyday life; and in place of altar-pieces for churches, and large historical and allegorical pictures for palaces, produced the subjects then in demand—portraits, *genre* pictures, or works in which life and manners are depicted in various phases—landscapes with and without figures, sea-pieces, battle-pieces, compositions representing hunting, animals, game, etc. The catalogue of the names of the able artists of these two schools is long; in the Flemish school, those who stand highest are Peter Paul Rubens (q.v.), (1577–1640), Anthony Van Dyck (q.v.), (1599–1641), David Teniers (q.v.) the younger (1610–90), F. Snyders (1579–1657). The following are the most eminent in the long list of artists of the Dutch school: Rembrandt (q.v.), (1608–69), Vanderhelst (1613–70), Albert Cuyp (q.v.), (1605–91), Terburgh (1608–81), A. V. Ostade (1610–85), J. Ruysdael (q.v), (1630 or 1636–81), Hobbima (1629–70), P. Potter (1625–54), K. du Jarden (1635–78), Jan Steen (q.v.), (1636–89), G. Metzu (1615–58), F. Mieris (1635–81), W. Van de Velde (1633–1707), A. Van der Neer (1613–84), P. Wouvermans (q.v.), (1620–68).

Painting has been practiced for a very long period in France; but there, as in Spain and in Britain, the marked preference shown in early times by the sovereigns of the country for the works of foreign artists, their undervaluing native talent, and their directing it into a channel supplied from a foreign source, had the effect of neutralizing it as the exponent of national feeling. Francis I. is acknowledged to have been a patron of art; he had a desire to possess fine works, and he liberally rewarded able artists, but his patronage was almost entirely confined to foreigners. Louis XIV. did what he could to place French art above that of every other nation; but he had no knowledge of it himself; he did not comprehend its nature and true intention, and imagined that pictures if painted by Frenchmen must necessarily be national. Nevertheless, his influence was, on the whole, highly beneficial to French national art. He always showed himself desirous to employ native rather than foreign talent, and he encouraged and enlarged the academy of fine arts, which had been founded at the commencement of his reign, under the direction of Lebrun. Although in many respects the principles and the regulations of the academy tended rather to the perpetuation of debased Italian, than to the development of genuine French art; yet the bringing together of a body of influential French artists, was the measure most likely to foster the feeling of nationality and to lead to the foundation of a national school of art. In the 16th c., François Clouet was distinguished as a portrait painter; and Jean Cousin as a painter, sculptor, and architect. In the 17th c., among many names, those chiefly deserving notice are Simon Vouet, the brothers Le Nain, N. Poussin, Claude Lorraine, Mignard, S. Bourdon, Le Sueur, J. Courtois (called Borgognone), and Coypel. Among these, the works of the brothers Le Nain alone possess national feeling and character, and they are held in very

considerable estimation; those of the others were executed under the influence of foreign art; and excepting Claude's splendid landscapes, Poussin's learned compositions, and some of Borgognone's battle-pieces, hold a low position. The works of Anthony Watteau (1684–1721) are truly national, excellent in execution, and very highly valued. This artist may be classed as at the head of the school of the 18th c.—the period in which art in France became really national. Not only did most of the painters of his school—which lasted till the end of the century, when classic art ruled for a time—form their style upon the works of Watteau, but his influence also affected the British school, which arose soon after that of France was developed. Lancret (1690–1742) was the most successful imitator of Watteau; Pater (1696–1736) followed in the same course; Chardin (1699–1779), though influenced by him, had an original style of his own, and his works now stand high. The pictures of Boucher (1704–70) exhibit the defects of the French school of the 18th c., unredeemed by the delicacy and grace, and high technical execution and truth of Watteau, Chardin, and Greuze (1725–1805), the last of whom sustained the character of French national art, and carried it into the 19th c., when it was re-established, after the classic school of David, founded at the revolution, and patronized under the empire of the first Napoleon, had in its turn been laid aside. David (q.v.), (1748–1825), the leader of this school, carried his admiration of classic art to the length of substituting the study of statues, the works by which the art of the ancients is chiefly known, for that of nature. He had numerous able pupils, several of whom, tired with this constant repetition of conventional form, recurred to nature, extended their range of subjects, and infused new vigor into the French school. Among many distinguished artists that have maintained the fame of the French school during the present century the following names may by mentioned: Géricault, Prud'hon, Leopold Robert, Delaroche (q.v.), Horace Vernet (q.v.), Ary Scheffer (q.v.), Eugène Delacroix (q.v.), and Ingres (q.v). A number of artists, chiefly pupils of the above, now sustain the high position of French art in every department; while in that of landscape illustrative of French scenery, a branch of art never much studied in past times, great progress has been made, and the rise of this flourishing branch of French art is acknowledged by the French themselves to be due to the works of the English painter Constable, exhibited in Paris in 1824.

The English school was the latest national school that arose in Europe, for although the modern schools of Germany and Belgium are of still later date, having arisen in the present century, still they can scarcely be classed as new schools, but rather as revivals of former national schools. In England, as in France, foreign artists chiefly were in early times employed by the court and the nobles. Henry VIII. competed with Francis I. for the services of the greatest of the Italian artists, and permanently secured those of Hans Holbein, one of the most distinguished of those of Germany. Charles I. liberally patronized Rubens and Van Dyck; and if he had reigned longer, would in all probability, like Louis XIV., have founded a national school. But referring to the separate notices in this work of the foreign artists under their names respectively who were employed in this country, and to the article Miniature Painting for notice of several eminent native artists in that branch of art, it is only necessary here to touch on the subject of painting in this country from the time it acquired a truly national character. At the beginning of the 18th c., art in Britain was at the lowest ebb; the career of sir Godfrey Kneller (q.v.) (1648–1725 or 1726), the last of the foreigners, was drawing to a close; sir James Thornhill (1676–1734), an Englishman, followed out the decorative kind of art on which Verrio, La Guerre, and others were so much employed; but after his death, that debased style finally went down. The time had now arrived for native artists, if there were any entitled to the name, to assert their independence; and accordingly, in 1734–35, as many as from thirty to forty artists combined together in London, and instituted an academy for studying the human figure. About the same time a similar movement was going on in Edinburgh; the contract or indenture for establishing a school of art, dated Oct. 18, 1729, and signed by 17 artists, besides amateurs, is in the possession of the Royal Scottish Academy. The effort above referred to, of artists combining to found a life academy, was mainly due to William Hogarth (1697–1764), who, on this account, and from his first having developed, in a very high degree of excellence in his works, the leading characteristics of the English school, is justly entitled to be considered its founder. This combination led to these important results—it showed the artists their strength, and enabled them, after a probation of 34 years, to found the royal academy, an institution managed by artists, and intended to support and encourage a national school of art. The means by which the royal academy proposed to attain its purpose were the following: 1, by founding a school where artists may learn their profession; and 2, by instituting an exhibition where, independently of private patronage and support, artists may bring their works directly before the public. Hogarth died four years before the royal academy was organized; but he powerfully contributed to its establishment by his exertions in bringing the artists together in 1734, by supporting the modern exhibitions at Spring Gardens, and by ridiculing by his pencil and pen the passion of the cognoscenti of the day for crying up as superior to the modern the doubtful specimens of old art which were largely imported and disposed of at great prices in numerous salerooms established for the purpose in London. As regards technical execution, and indeed in style generally, the English artists were at first indebted to the

French school, which, in the commencement of the 18th c., was in great vigor. Hogarth himself, in these respects, looked closely at the works of Watteau, engravings from which were well known in Great Britain in his time; indeed, Watteau's pictures were so greatly admired there that he went over and spent the year 1720 painting in London. But Hogarth, though alive to the qualities in art produced by others, ranks among painters as one of the most original, for he greatly extended the dramatic element in painting, and imparted an originality and vigor to it never before attained; and his example has led to that element being one of the leading features of the English school, as is exemplified in the works of Wilkie (q.v.), Leslie (q.v.), Stuart Newton, Bonington, and others; and those of many distinguished artists of the present day. In the department of portrait-painting, many of the works of the British school rank with those of Titian, Van Dyck, and Velasquez, such, for instance, as Reynolds's portraits of Nelly O'Brien and lady Hamilton, Gainsborough's Mrs. Graham and Mrs. Siddons, and some of Raeburn's heads, etc. While in that of landscape, the position of the English school is acknowledged to be very high, its influence now strongly affecting the French school—this is proved by the works of R. Wilson, Gainsborough (q.v.), and Turner (q.v.), the last of whom, for wide range of subject, and rendering of atmospheric effect, stands alone; Constable, whose powerful grasp of nature has excited the emulation of the French artists; Calcott (q.v.), Collins (q.v.), Nasmyth, J. Thomson, Muller, and others; and their successors, the artists of the day, who ably represent the English school. Animal-painting has also been elevated to a high position. And an important department, that of painting in water-colors, originated in England, and has there attained far higher excellence than in any other country. See WATER-COLOR PAINTING.

Painting is cultivated with success and receives much encouragement in America, but there the features that mark a national school have not yet had time for development. From the close connection between Britain and America, the art of the latter country was naturally influenced by and became assimilated to that of the former. America may, however, justly take credit for having contributed in no small degree to strengthen the British school of art, as several very able members of the Royal Academy were Americans. Benjamin West (1738–1820) was one of the original members, and elected president of the Royal Academy in 1806. J. S. Copley (1737–1815) elected R.A. in 1799; his "Death of Chatham," and "Defense of St. Heliers, Jersey, against the French, and Death of Major Pierson at the moment of Victory," are excellent works, and as such were conserved in the National Gallery, London. C. R. Leslie (1794–1859) was born in London of American parents; but in 1799 went to Philadelphia, where he was educated. Returning to London in 1811, he entered the schools of the Royal Academy; was elected academician in 1826, and professor of painting in 1848. G. S. Newton (1794–1835)—he was admitted a student of the Royal Academy in 1821, and elected academician in 1832. Washington Allston (1780–1843) was elected an associate in 1818; but afterwards returned to America, where he died. With the exception of the last named, the feeling evinced in the works of all these artists, influenced by study and continued residence, was essentially English; indeed few have equaled Leslie and Newton in their power of embodying the various incidents made national by English poets; and in none of their works can anything be set down as contributing in any degree to the foundation of a national American school. There is every reason to think, however, that such a school is being gradually evolved, and will soon be developed. Already something like originality of a national kind is exhibited in landscape painting, in which some American artists are endeavoring to embody scenes embracing a vast extent of country, or of extraordinary magnitude—such as those met with in the Andes, at Niagara, or exhibited by floating icebergs; and American literature, having now assumed imposing proportions, and great historical events having recently taken place, illustrations of American poetry and pictures of stirring national events will be called forth; and able American artists will doubtless be found to embody them and create a school truly national.

A general survey of painting at the present time exhibits the following aspect and arrangement: 1. A school in Germany, which arose during the present century, ostensibly a revival of the old national, but truly modeled on the early Italian school, the religious element being prominent. Its principal works are mural, of large dimension, and mostly executed in fresco, or on a kind of fresco lately invented, called silica or water-glass painting, from a vehicle of that kind being used. Invention, composition, grouping, and powerful and correct drawing, characterize the modern German works; but being of necessity executed from cartoons, they are deficient in that amount of individual expression, and natural color and effect, that can only be attained by a direct and continued reference to the object represented. 2. A Belgian school, which arose in the present century, and is also a revival of the earlier national schools. Some of the Belgian artists lean to the manner of the very early Flemish school, others to that of which Rubens was the head. The greater portion of the Belgian works are easel-pictures, and many of them rank high for individual expression, color, and technical execution. 3. A French school, exhibiting in active operation the various styles that have at different periods prevailed in that country, sometimes modified or adapted to the taste and feeling of the times. The works of the French school of the 18th c. were utterly condemned by French artists at the close of that and commencement of the present

century. They would tolerate nothing but what they called classic art. *L'Ecole classique*, as it was styled, was in its turn supplanted by *l'Ecole romantique*. Now, however, all styles are tolerated, even those of foreign schools—for instance, the English school of landscape—and there can be no doubt that, by the extensive range of subject, invention, drawing, and other high qualities the French artists display in their works, they have now raised that school to a very high position. 4. A British school, which has been in existence as a national school nearly as long as that of France, undisturbed by the convulsions that affected it. Vitality in art is maintained by close reference to nature, and this has all along been the leading characteristic of the English school; while the tendency of the artists at present is, taking advantage of the aid of science, which has lately discovered photography, to study nature with still greater earnestness and care. The high claims of the British school, long denied abroad, are now fully admitted. Formerly, foreigners never classed a British school among those of Europe, but now this is invariably done. One of the most popular writers on art in France, Théophile Gautier, in his work, *Les Beaux-Arts en Europe*, divides the art of the world into four strongly-defined zones—viz., Great Britain, Belgium, Germany, and France—Britain being distinguished by "individuality," a potent element in art; Belgium, by "skill"; Germany, by "ideality"; and France, by "eclecticism,"or a selection and combination of the qualities of all other schools.

Regarding technical modes or processes of painting, reference is made to the separate notices under Fresco, Encaustic, Miniature Painting. The period when the method of mixing up colors with oil was introduced, and the artists to whom the invention is attributed, have been already alluded to. It is necessary, however, to enter on some details touching the mechanical processes in oil-painting, the branch of the art that occupies the most prominent position; and the practice of cleaning and restoring pictures.

The implements used by a painter in oil are charcoal, chalk, or lead pencils, for drawing the outline; hair-pencils or brushes of various sizes, made of hog's bristles or finer hair, such as sable; a knife or spatula to mix the colors, and a palette or small table of thin wood, to be held in the left hand, on which the colors and tints are placed and mixed; an easel or stand for supporting the picture is also required, and a light rod for steadying or resting the hand on. Large pictures are always executed on canvas, stretched tightly on a frame, and primed or coated with paint. Small pictures are often painted on boards or panels, generally of hardwood, such as oak or mahogony, and similarly primed or prepared; but canvas, even for small works, seems at present to be generally preferred. Panels are apt to twist, or warp, or split, and in the event of the surface of a picture chipping or breaking off from the ground, the damage can be more easily remedied, and its progress stopped, when the picture is on canvas, by re-lining. The color of the ground of the canvas or panel has been the subject of much diversity of opinion among artists in different countries and at various periods; and it is certainly a matter of great importance, as it affects the general color of the work, or makes it necessary for the artist to adopt a peculiar style of working. The color of the ground used by the early masters was white, or nearly purely white. This arose from tempera or size being the medium first used in painting, and a pure white ground prepared with size was necessary for that kind of work. This practice, except as regards the Venetian school, continued till the decline of Italian art. Dull red was the universal color adopted in the eclectic, naturalistic, and late Italian schools, and this is one of the causes of the works of these schools being characterized by blackness and heaviness; at the same time, it is certain that red grounds were also used by many of the best Venetian painters, in whose works these defects are never found, probably from having used an impasto or body of color sufficiently powerful to bear out on the ground. A dark ground affords a facility for working expeditiously, and that, probably, was the principal cause for its being adopted. The Dutch and Flemish painters generally used light grounds; some of them light-brown, nearly the color of oak. Van Dyck occasionally used gray, and sometimes, when he painted in Italy, dull-red grounds. In the British school, light grounds are preferred. Some artists use smooth canvas, others prefer it rough, and avail themselves of the texture to increase the richness of the surface of their work. All these varieties in the materials are called for in consequence of the numerous styles or modes adopted by painters in oil colors. Every artist has his peculiar way of working, and in bringing out the color or effect, or special quality in his picture, by which the feeling or idea of the subject he conceives is expressed. No two artists—imitators and copiers are not referred to—produce their tints by mixing colors in the same proportions, nor, indeed, by using the same colors; and it is difficult to lay down general rules for the execution of works, seeing that depends very much on individual feeling and appreciation. The design or drawing is first outlined on the canvas, if it is light, with charcoal, or with white chalk when it is dark, and these lines are easily dusted off or rubbed out when corrections are made. It is then put in with black chalk or a lead pencil. Not many years ago it was the practice of painters, particularly landscape-painters—Nasmyth, for instance—to rub in the design with some brown color, such as a tint composed of burned sienna and black; but this practice is not much adopted now. Some artists make but a slight outline, and paint—or, as it is called technically, rub—in the subject in a bold, rough manner, afterwards gradually finishing it up; others draw the design very care-

fully, and work the picture up in portions, finishing or nearly finishing one portion before commencing another. In arranging the colors, or as it is called, setting the palette, many artists use a great variety of colors, others produce rich tones with few colors; some mix up tints in various gradations, others place the colors on the palette, commencing at the outer edge with white, followed by yellows and burned sienna (a reddish brown), then reds, including lakes, such as pink, madder, next blue, and lastly black, and merely mix up the tint on the center of the palette with their brush, as they proceed. In laying the colors on the canvas, the painter with his brush mixes or dilutes them with what is called a vehicle or medium. Here, again, the practice of artists is very varied; and this is a matter of importance, as the tone and quality of the picture, as regards texture or surface and transparency, is much affected by the medium employed, and the manner of using it. The durability of the work also depends very much on the medium and the artist's management of it. A medium composed of mastic varnish and drying or boiled linseed oil, named magilp, is that most generally used. This mixture coagulates or forms a jelly, and has the advantage, when placed on the palette, of not running off it, or mixing with the colors when the palette is not held level. Some painters prefer using raw linseed oil mixed with a dryer, such as litharge, or drying oil mixed with turpentine, or copal varnish and turpentine, or copal varnish and oil, with mastic varnish added, to make it coagulate. Other ingredients are often mixed with the medium to give a thick consistency to the paint, such as fat or thickened nut oil, paste, etc.; and various preparations sold by artists' colormen are much used; for instance, Roberson's medium, and Siccatif de Harlem, a preparation imported from Paris. The mode of using the medium is of great consequence; some apply it very sparingly, others, particularly those who prefer magilp, or a medium that coagulates, employ it lavishly. By the first method, firmness and decision of touch may be exhibited, by the latter, richness and brilliancy of tone; the excess tends to produce, in the one case, a hard and dry surface, and the want of the protection that varnish mixed with the color gives against atmospheric action; the other induces a surface having a horny appearance, and a tendency to darken, or crack, or open up.

Arresting the decay of pictures, and repairing, or, as it is styled, restoring them, after they have suffered from age or bad usage are matters which engage much attention. There can be no doubt that many paintings of vast importance have been saved by the care and skill of those who have earnestly devoted themselves to that kind of work; but picture-cleaning is now a trade followed in numerous instances by ignorant pretenders and quacks, who hold out that they possess some means by which they can freshen a picture, and restore it to the state it was in when originally executed. Generally speaking, the great extent to which this business is carried on is owing to the credulity of those who dabble in collecting old pictures, one great incentive to which being the hope of picking up, or discovering, some picture of great value concealed under the dirt and discoloration acquired in a long course of years; but, nevertheless, there can be no doubt that many proprietors of works of art who collect from far higher motives are remarkably prone to call in the picture-cleaner when his services are anything but necessary or beneficial. The late sir Edwin Landseer, R.A., when examined by the select committee of the House of Commons appointed to inquire into allegations of damage by cleaning, sustained by the pictures in the National Gallery in London (report and evidence ordered to be printed, 1858), stated in the following terms, his idea of this rage for picture-cleaning, or rather picture-destroying: "The first thing, whenever a picture is sold, I think, is, that it goes to a picture-restorer, or a picture-liner, or a picture-cleaner, no matter what its condition is. It is exactly the same thing as when you buy a horse; your groom says he will be all right when he has a dose of physic through him, whether he wants it or not." The mania for picture-cleaning is not confined to this country; it is extensively carried on with even more ruinous consequences abroad, particularly in Italy, where there is a large traffic in old, and few commissions for modern works, and where in many of the public galleries one or more picture-cleaners, for whom work must be found, are attached as permanent officers.

The process of picture-cleaning, or the removal of the old varnishes or other incrustations by which a painting may be obscured, is effected either by mechanical or chemical means. The first method is accomplished when the varnish on the surface is mastic, by rubbing with the fingers the surface of varnish when in a dry state, by which action it is brought off in a fine white powder; or by scraping or erasing the surface with sharp steel instruments when the surface of the picture is tolerably smooth. The first of these processes is the best that can be employed; but when the surface is rough or unequal, the prominent portions are apt to be over-rubbed; erasing or scraping is often practiced in Italy, but rarely in this country. The chemical means consist in the application of solvents, chiefly alkali, or alcohol, to dissolve the old varnish. The danger here is, that the action of these solvents is not always stopped with sufficient promptness and dexterity, and part of the surface of the picture is taken off; consequently it is by this latter process that most destruction is caused. For the various methods employed in picture-cleaning, the report and minutes of evidence, already referred to, may be consulted, and the *Guide Théorique et Pratique de l' Amateur de Tableaux, par Théodore Lejeune* (Paris, 1864), in which are stated all the most approved methods of cleaning and restoring pictures.

Painting in the United States had a very slow development until a comparatively recent date. The colonial period and the first half century of the republic were not conducive to the culture of art, although even then America had already produced artists of merit, recognized both here and in Europe—notably Benjamin West (1738–1820), who was not only honored by the academies of Florence, Parma, and Bologna, but made president of the royal academy of England: of his numerous works, estimated at 3,000, most are in that country, but his "Lear," "Hamlet and Ophelia," "Christ Healing the Sick," and "Rejected Christ," are in this country. Copley (1737–1815) also ranks very high as a portrait painter, whose works were valued for both truthfulness and coloring. His historical paintings, likewise, were much admired, and three are in the national gallery. It is said that the first American flag hoisted in England appeared in a portrait by him, Dec. 5, 1782, the day on which the king formally recognized the United States. Leslie (1794–1859), also, was honored in England, and valued for the high class of *genre* subjects which he painted; but though he was appointed professor of painting in the royal academy, and published *A Hand-book for Young Painters*, he excelled least in coloring. Allston (1779–1843), although named last, is really the first American artist who rose superior to the English traditional style, which more or less characterized the productions of the former. His "Spalatro" or "The Vision of the Bloody Hand" he esteemed the best of his pictures. Mr. Page said of it: "In color it is not as good as the best of Titian's, yet few pictures of Titian's, of that size, are so good in color. In composition and chiaro-oscuro it is one of the great pictures." His was a genius of no common order; the versatility of his conceptions, and the lofty purity of his spirit shining in them, entitle him to a place in the front rank of the best painters of the period. "The beauty of 'Beatrice' and 'Rosalie,' the prophetic sternness of 'Jeremiah,' the grace of 'Miriam,' the moonlight effects, the forests and mountains of his landscapes, the horror of 'Spalatro,' and the impressive mysteriousness of 'The Reviving Dead Man,' display a wonderful scope of thought, and a surprising power of execution" (Clement, *Handbook etc.*).

A distinctly accentuated American school of painting had no existence before 1825 when Thomas Cole (1801–1848) originated what has been called the American school of landscape painting. His experiments were views of the Hudson, for which he found a ready market. When some of his autumnal pieces, reflecting the glories of American sunshine, were exhibited in England, they were thought the invention of an extravagant Yankee. Although his allegorical pictures are most celebrated, they are artistically inferior to his landscapes, which are lovely and loving reproductions of nature. He painted nature in England, Sicily, and Italy, but he loved her nowhere so intensely as in America, and performed with his brush the same service for our scenery, as has been said, which Bryant performed with his pen. He wrote from Italy, "Neither the Alps, nor the Apennines, nor even Etna itself, have dimmed in my eyes the beauty of our own Catskills." Among his numerous followers in that department of painting, and among the earliest American artists who interpreted with truth and feeling our autumnal season, Thomas Doughty deserves to be named. The first American painter who attempted *genre*, with rather doubtful success, was Henry Inman; his pictures are quite numerous; some of his portraits are in the Boston Athenæum, Independence Hall, Phila., City Hall, N. Y., and the capitol at Albany; his *genre* pictures are in private collections, and among them are the "Boyhood of Washington," the "Newsboy," "Awaking of Rip Van Winkle," etc. Rembrandt Peale (1787–1830), the son of Charles Wilson Peale, who painted 14 different pictures of Washington, and established a museum in Philadelphia, is said to have produced the best portrait of Washington; he painted two historical subjects, but both he and his father were portrait painters. Since then there are few departments of painting in which American artists have not labored, and often with marked success; the limits of this article preclude even passing notices of the best of their works. The fields of history and *genre* give us the names of Rothermel, Page (a fine colorist), Eastman Johnson, Winslow Homer, Leutze, Weir, May, Powell, Darley, Lambdin, Hennessey, Hall, Brown, Terry, Coleman, Freeman, Perry, Vedder, and Wood. Marine subjects, those of Bradford, Dana, DeHaas, Dix, Haseltine, Moran, and others. Animals are treated by J. H. and W. H. Beard, Butler, P. Moran, Tait, Hay, and Hinkley. Portraiture is cultivated by Ames, Baker, LeClear, Flagg, Gray, Hicks, Hunt, Staigg, Stone, and many more. Landscape furnishes the names of Church, Bierstadt, Kensett, Inness, James M. and William Hart, Cropsey, Casilear, the Giffords, Brown, Bristol, Cranch, Griswold, Gignoux, Wyant, Fitch, and many besides.

Landscape is probably the true field for the growth of a pure and noble American school of painting, where leaning on foreign schools might be, and ultimately will be, avoided. It is not the departed classicism of the older masters, nor the fashionable adaptation of French coloring and ideal lines, nor the realistic and utterly unpoetic prosiness of so many English landscapes that is required, but an honest, persistent study of American scenery, which needs no foreign aid to be truly and enthusiastically portrayed. It is difficult to indicate the horizon of the ideal; ideality pertains as much to poetry and music as to painting; it may be said to be its very soul; but an ideal painting is not necessarily an exaggerated one of impossible mountains, gigantic foliage, and garish illumination.

In the domain of historical paintings, likewise, the drift is an escape from such barren literalness as is often found crowded into walls of canvas; it is not size, or the multiplication of figures about as life-like as the ordinary photograph, but spirit, the true and feeling poetry of the motive, that are wanted, and here also there is a manifest tendency to idealize. In portrait painting it is not the minute delineation of secondary accessories, but expression, that now rivets attention, and in that field lies the amplest scope for the application of true artistic skill. In a photograph there may be resemblance; in a portrait, if it be a portrait, there must be speaking likeness, life-like, or better still, living expression of character, mood, and carriage; here also the drift is in the direction of the poetic or ideal. The same drift seems to characterize genuine American *genre*, e.g., George Fuller's "And She was a Witch" plainly shows that motives may be found on native soil admitting of poetic and ideal treatment. Anything more unpleasantly bare than the "Coming Man," by Frank Duveneck, and painfully realistic than Muhrman's "Bather," could not easily be conceived. Realistic or exaggerated literalness should have no place in American *genre*. As the number of French pictures, and of the Düsseldorf and Munich schools, in the United States, is much greater than that of others, a certain leaning on their styles is more or less perceptible in not a few of the recent productions of our native painters, as a leaning on the English style characterized the works of our earlier artists. With the growth of art in the country, and the growth of an art *clientèle*, the tendency to study with seriousness, and to rise to higher standards, American art, with her illimitable resources and possibilities, has a bright future before it; and the time will come when writers like Lübke will, in 8vo volumes of 900 pages, find a little more to say of art in America than in the six lines which dispatch it by the juxtaposition of the names of Leutze, Winslow Homer, Thomson, Bierstadt, Whittredge, Coleman, and Gifford. The Preraphaelite movement of English origin, and by no means limited to England, at one time obtained a certain vogue here, but its grotesqueness prevented it from ever being permanently national among us.

Attention is directed to the superior art-illustrations which of late years have been introduced in American publications, and they very often, and very felicitously, bring matter purely American in conception, motive, and force.

Works on painting and painters: Vasari (Florence, 1568); Borghini (Florence, 1584); Rodolphi (Venice, 1648); Zanetti (Venice, 1771); Lanzi (1792), Bohn's edition of Roscoe's translation; Von Rumohr (Berlin, 1827); Kugler's *Hand-book of Painting, Italian Schools* (ed. by Eastlake, 1855), *German, Flemish, and Dutch Schools* (1846); *Spanish and French Schools* (1848); *History of Painting in Italy*, by Crowe and Cavalcaselle (1876); *Handbook for Young Painters;* by C. R. Leslie, R.A. (1855); Ruskin's *Modern Painters* (1843–60); *History of Painting: Ancient, Early Christian and Mediæval*, 1880.

PAINTING (House) is one of the useful arts, combining much that is artistic with much that is absolutely necessary. The primary object of painting houses, or parts of them, either internally or externally, is to preserve them from decay—to cover the parts liable to suffer from exposure with a durable composition. That now used is made of ground white-lead mixed with linseed oil. This produces white paint, which forms the basis of all others. The various colors given to it are produced by the grinding of pigments (or *stainers*) along with the white-lead. The commonest of these are ochres (yellow and red earths), lampblack, Venetian red, umber, Prussian blue, chrome, vermillion, etc. Substances called driers are also mixed with the paint, such as spirits of turpentine, boiled oil, litharge, and sugar of lead ground in oil. Paint may be laid on any material —stone, wood, iron, and plaster being the most usual in buildings. It has the effect of preserving these by filling up the pores in them and forming a coating on which the moisture of the atmosphere does not act. The paint is laid on in several *coats* or layers, each being allowed to dry before the next is applied. The usual number of coats for new wood or plaster varies from three to six. Five coats form a good and lasting protection from the weather. Plain painting is generally finished with a coat prepared with a mixture of oil of turpentine, which takes off the gloss from the paint, and leaves the surface quite *mat* or dead. This is called *flatting*. A very common form of decoration in all ages has been to imitate the veins or colors of marbles, and the *grains* or marks of growth of various woods. In modern times these arts form a separate branch of house-painting, some men being *grainers*, others *marblers*, etc. The mode in which these imitations are produced is by forming a *grounding* of several coats of plain paint—usually four—and applying the coloring coat over this. In marbling the coloring matter is marked and veined with *feathers*, in place of brushes; and in graining steel combs are used. When the surface is dry it is protected with one or more coats of copal varnish.

Besides painting, the decorator uses paper-hangings for adorning the walls of houses. These are applied to the walls with paste. Size-coloring is also used, the coloring matter being mixed with strong size (see Gelatine) in place of oil; but this has the disadvantage of being easily acted on by moisture. It is often used for the ceilings of common rooms, and for the walls of kitchens and servants' apartments, being much cheaper than oil-paint. In ancient times, in Greece and Rome, wax was used in mixing the colors with; but although there are many very fine specimens of Roman paintings still preserved on the walls of the houses of Pompeii, the mode in which these decorations were applied is not known.

PAINTS, PAINTERS' COLORS, or PIGMENTS. These names are applied to the prepared or unprepared compositions by which wood, stone, and other materials are coated with a preservative surface of oil, mixed with an earthy matter to give it color and consistency; also to the materials used by artists to produce the colored surfaces of their pictures. The art of painting in its primitive state consisted merely in applying such natural, mineral, and vegetable colors as were spontaneously yielded, without any vehicle to render them permanent, consequently they had to be renewed as often as they were rubbed or washed off from the surfaces to which they were applied. The paints now in use are nearly all mixed with a liquid vehicle, and are applied in the liquid state. The mixing materials are varied according to the requirements of the work. Thus for some kinds of decorative work, and for water-color drawings, gum, glue, size, or other adhesive materials dissolved in water, are employed; whilst for the painting of buildings, etc., and for oil-paintings, oils of various kinds are used for mixing and thinning the colors. Thus, for painted work exposed to the weather, it is found that linseed oil boiled with the sulphates of lead (litharge) or zinc, or with acetate of lead (sugar of lead), is the best. The preparation of boiled oil is one requiring particular care, as it is desirable to have it bright and clear. Hence the proportions of the metallic salts are much varied by different manufacturers, and by some various other ingredients are added. The time of boiling and the method of filtering are also much varied. For indoor work, plain linseed oil and oil (spirit) of turpentine are used; if a *glossy surface* is wished, the linseed oil must be in excess; if a *dull* or *flattened surface*, then the quantity of turpentine, or *turps*, as it is often technically called, must be increased; and it is usual to add a small quantity of ground litharge and sugar of lead, which are prepared for this purpose, and sold under the name of *driers*. For artists' colors, very fine linseed or nut oil is used, unboiled, and in small quantity, and turpentine is employed to dilute them. Paints for very rough purposes, such as ship-work, stone walls, etc., are often mixed with whale oil boiled with white vitriol (acetate of zinc), litharge, and vinegar, and they are diluted with common linseed oil and turpentine.

Most of the paints used for ordinary purposes are composed first of the coloring matter, then of a quantity of white-lead, with which and the oil they are worked into a paste of the shade required, and afterwards thinned down with oil and turpentine when used. The white-lead which thus forms the basis of most paints, and by itself a color, is a carbonate and oxide of the metal, produced by exposing pieces of lead to the action of the steam of acetic acid in beds of fermenting tan. It is the principal white paint used, but is liable to discoloration from the gases contained in impure atmospheres. Other white pigments are prepared from the oxide of zinc, and the carbonate and sulphate of barytes. Pale yellow is made with chromate of strontian, orange-yellow with sulphuret of cadmium, whilst several varieties of this color are produced by chromate of lead, sulphuret of arsenic, or king's yellow, and various native earths in which silica and alumina are combined with oxide of iron. Amongst these are yellow ochre, Oxford, Roman, stone, orange, Indian, and American ochres. *Reds* are either purely mineral, or they are *lakes*, i.e., organic colors precipitated on alumina bases. Of the latter there are madder-lakes, prepared from madder-roots, and carmine-lakes, prepared from cochineal; of the former, vermillion (bisulphuret of mercury), Indian red (a native oxide of iron), Venetian red (also an oxide of iron), red lead (red oxide of lead or *minium*). A very beautiful red is used by artists called palladium red; it is formed of ammonio-perchloride of palladium. *Blues* consist of the artificial ultramarine, and for artists' purposes of the real ultramarine, also the silicate of cobalt, and for water-colors, indigo and Prussian blue. *Greens* are either produced by mixtures of *yellows* and *blues*, or they are made directly from the phosphates, carbonates, acetates, and arsenites of copper, also from the sesquioxide of chromium and from *terre verte*, a native mineral, consisting of iron, silica, potassa, and magnesia. The last two are the best for artists. *Browns* are numerous, and various in their composition. Decomposed peat, burned madder, burned Prussian blue, burned terre verte, asphalt, manganese brown, catechu, umber (which is an oxide of iron with manganese), and mummy, or the asphalt mixed with other matters taken from Egyptian mummies, are amongst the best known and most used. *Blacks* are made of lampblack and bone-black (q.v.), peroxide of manganese, and blue-black, which is made of the charcoal of burned vine twigs.

In all cases the coloring materials of paints require to be very finely ground; and as many are very poisonous, great care is required in their preparation, and several forms of mill have been invented for the purpose. The principle upon which all are made is to secure the operator from the poisonous dust and exhalations, and to reduce the coloring material, if ground dry, to an impalpable powder, or, if mixed with the oil, to a perfectly smooth paste.

PAIRING, is the agreement of two members of opposite political parties to absent themselves from the duties of the House without the consent of the House, and without deducting their *per diem* pay during the time of such voluntary absence. It is a clear breach of the rules of the House. The first instance of the kind known in the American congress was in 1840, during the presidency of Martin Van Buren, and was severely rebuked by John Quincy Adams, who characterized it as a most reprehensible custom. A resolution was prepared by him declaring that "pairing-off" involved the violation of

the constitution of the United States, an express rule of the House, and of the duties of both parties in the transaction to their immediate constituents, to the House, and to the country. The resolve was placed on the calendar, but was not reached during the term, and hence was not voted upon. Since that time the practice has become common.

PAISIELLO, GIOVANNI, an eminent musician, son of a veterinary surgeon at Taranto, was b. in 1741, and received his musical education in the conservatorio St. Onofrio at Naples. Of his earlier operas produced at Naples, the most celebrated was *Dal Finto al Vero*, composed in 1777. Some of his best works, particularly *Il Barbiere di Siviglia*, were written during an 8 years residence at St. Petersburg. At Vienna, he composed 12 symphonies for a large orchestra, and the opera buffa, *Il Ré Teodoro*. Between 1785 and 1799, he produced a number of operas for the Neapolitan theater, and was appointed by Ferdinand IV. his *maestro di capella*. In consequence of having accepted under the revolutionary government the office of national director of music, he was suspended from his functions for two years after the restoration of royalty, but eventually restored to them. In 1802, he went to Paris to direct the music of the consular chapel; but the indifferent reception shortly after given to his opera *Proserpine*, led him to return to Naples, where he died in 1816. His compositions are characterized by sweetness and gracefulness of melody, and simplicity of structure. Besides no fewer than 90 operas, Paisiello composed masses, requiems, cantatos, an oratoric, instrumental quartets, harpsichord sonatas, concertos, and a highly praised funeral march in honor of Gen. Hoche.

PAISLEY, a municipal and parliamentary burgh, and an important manufacturing t. of Scotland, in the co. of Renfrew, on both banks of the White Cart, 3 m. above its junction with the Clyde, and 7 m. w.s.w. of Glasgow by railway. The progress of the town has been much hindered by the fact that it was bankrupt for nearly 30 years. A bill was passed in 1872, by which a settlement was effected, and the town property restored to the corporation. Since then, extensive improvements have been made. An abundant supply of water is brought from the Gleniffer hills, and more recently from Rowbank.

By far the most interesting edifice is the abbey. It was founded by Walter, the high steward of Scotland, about 1163, for a prior and 13 monks of the Cluniac order of reformed Benedictines, and was dedicated to St. James, St. Mirren, and St. Milburga. It was the burying-place of the Stewarts before the accession of that family to the throne, and was occasionally used by them afterward as a place of sepulture. It was raised to the rank of an abbey in 1245. What remains of the building is the nave, of 6 bays, chiefly in the first pointed style. In 1862 a thorough restoration of the abbey (at a cost of £4,000) was made, the happiest feature of which was the removal of the unsightly galleries. The eastern gable window represents the ascension. It is of Munich manufacture. Another window has been inserted by the St. Andrew's society of Glasgow, in memory of sir William Wallace, who, if he was born at Ellerslie, was a native of the abbey parish. Extensive improvements in the surroundings of the abbey have also been made.

In the beginning of the last century the principal manufactures were coarse linens and checkered cloths. About the middle of that century the weaving of linen and of silk gauze became the staple manufactures. In 1784 silk gauze was manufactured to the value of £350,000, and employed 5,000 looms. Shawls, which used to be a principal and are still an important article of manufacture, began to be made here in the beginning of the present century. Within recent years the annual value of the shawl trade of Paisley was estimated at about £1,000,000 sterling, but it has now greatly declined. Cotton thread is manufactured on a most extensive scale; indeed Paisley may be considered the seat of the thread manufacture for the home and American markets. Different varieties of tartan cloths, handkerchiefs, carpets, etc. are made; soap, starch, and corn flour are largely manufactured; dyeing is carried on by several firms on an extensive scale; and power-loom factories, print-works, machine shops, bleach-fields, ship-building yards, etc., are in operation in the town and vicinity. At the St. James' day fair, horse-races, originated by act of the bailies of the burgh in 1608, are held. Pop. '81, 55,642; '91, 69,295; '96, 72,902.

PAIXHANS, HENRI JOSEPH, 1783–1854; b. France; educated at the polytechnic school, and appointed to the artillery, in which he rose to be gen. He made valuable improvements in heavy ordnance, in gun-carriages and projectiles, and the methods of working guns. The Paixhans gun, intended for ships of war or coast fortresses, and adapted to throwing shells and hollow shot, was adopted in France about 1824, and afterwards in England. It was used by the Russian fleet which destroyed the Turkish forts and ships in the harbor of Sinope. Paixhans recommended cylindro-conical projectiles as going more directly and striking more powerfully than round balls, and exposed to less resistance from the air. He believed in smaller ships carrying heavier guns for firing shell and hollow shot. The original Paixhans gun was 9 ft. 4 in. long, with a bore of 8⅔ in., and a weight of about 7,400 lbs. The charge was between 10½ and 18 lbs. of powder. It would bear hollow shot of 60 lbs., or solid shot of 86 to 88 lbs. He wrote several works on naval artillery.

PAJOU, Augustin, 1730–1809; b. Paris; pupil in sculpture of the eminent Lemoine; obtained the grand prize for sculpture in the French academy in 1748, with the privilege of going to Rome to complete his studies. On his return after 12 years he was elected a member of the academy. In 1767 he became a professor. Louis XVI. employed him to adorn with sculptures the façade of the Palais Royal, and to execute statues of Pascal, Turenne, Bossuet, Buffon and Decartes. He executed also the sculptures of the Salle del' Opera at Versailles; the ornaments of the Palais Bourbon, and of the cathedral of Orleans. Gabet says he was the sculptor of about 200 works in bronze, marble, stone, wood, and even paper or pasteboard. He received a handsome fortune from his works, but lost it by the revolution, and for the rest of his days was in comparative poverty.

PA'KENHAM, Sir Edward Michael, 1779–1815, b. Ireland, made major of dragoons 1794, lieutenant 1799, colonel 1809, and major-general 1812. He was quartermaster under Wellington in the Peninsular campaign. In 1814 he commanded the expedition against New Orleans, and was killed at the battle of New Orleans, Jan. 8, 1815.

PAKS, a market t. of Hungary, in the co. of Tolna, 60 m. s. by w. of Budapest, on the Danube. The river is here very winding, and the eastern bank a desert and useless morass. The town is frequently subject to inundations. Pop. '90, 11,803.

PALACE, this title is applied, with few exceptions, in Great Britain to houses occupied by royal personages only. In Italy the name is given to all fine dwellings.

PALACKY, František, a Bohemian philologist, critic, and historian, was b. June 14, 1798, at Hodslavitz, in Moravia, and studied at Presburg and Vienna, confining his attention chiefly to philological and historical investigations. In 1831 he was appointed by the states of Bohemia historiographer to that country, and was intrusted with the compilation of a general history of Bohemia. In furtherance of this work, he ransacked all the libraries and archives in Bohemia, and made long visits to Germany and Italy in search of materials. He took in the political agitation of 1848, and was the leader of the Slav or national party as opposed to the German at the diet of Kremsier, after the dissolution of which he returned to his literary labors. His great and justly celebrated work, *History of Bohemia* (in German and Bohemian, Prague, 1836–67, 5 vols.), was received with enthusiasm by the whole Bohemian nation. Besides an early treatise on æsthetics, Palacky published many volumes of documents pertaining to Bohemian history, and a series of monographs on the same subject; a work on the most ancient monuments of the Czech tongue; an account of a literary tour to Italy in 1837; and in 1872 his *Political Testament.* "Father Palacky," as he was fondly called by his Czech fellow-countrymen, was beloved by them as the first to give access to the real history of Bohemia; and, though himself a Protestant, was regarded by Catholics with perfect confidence. Throughout life a zealous contender for the crown rights of Bohemia, he persistently but vainly opposed the reconstruction of Austria on a German-Hungarian basis; and when in 1861 he was elected into the Austrian house of lords, he declined to attend. He died in May, 1876.

PALADIN, a term originally derived from the counts Palatine, or of the palace (see Palatine), who were the highest dignitaries in the Byzantine court, and thence used generally for a lord or chieftain, and by the Italian romantic poets for a knight-errant.

PALÆOGRAPHY. See Paleography.

PALAFOX Y MELZI, José de, Duke of Saragossa, a Spanish patriot, was b. in 1780 of a distinguished Aragonese family, and received an excellent education. He accompanied Ferdinand VII. to Bayonne, and on seeing him made a prisoner there fled to Saragossa, where he exerted himself to prevent the invasion of Aragon by the French. His defense of Saragossa (q. v.), July 27, 1808—Feb. 21, 1809, which only yielded to the French after a second investment, is one of the most brilliant and heroic incidents in modern history, and has conferred lasting glory on Palafox and the whole city. The ancient fame of the Spaniards for obstinate valor in the defense of walled cities was rivaled, if not surpassed, and Saragossa could proudly claim to vie with Numantia. Palafox, sick and exhausted, was taken prisoner and conveyed by the ungenerous French to the dungeons of Vincennes, where he was treated with great hardship. Released in 1813, he returned to Spain, and was appointed in the following year captain-general of Aragon. Palafox was no great politician, but he loved liberty and hated anarchy, and on more than one occasion he supported the former and crushed the latter. After being created duke of Saragossa, and grandee of Spain of the first class in 1836, he kept himself apart from politics. He died at Madrid, Feb. 16, 1847.

PALAI'A, a t. in n. Italy, province of Pisa, 19 m. from the city of Pisa; pop. abt. 11,000. It was once a fortified town, and is situated on elevated land.

PALAIS ROYAL, a heterogeneous mass of buildings on the eastern side of the rue Richelieu in Paris, composed of a palace, theaters, public gardens, bazaars, shops, cafés, and restaurants. The old palace was built between 1624 and 1636 on the site of the hôtel Rambouillet by cardinal Richelieu, who at his death bequeathed it to Louis XIII. Henrietta of France, widow of Charles I., and Anne of Austria, the queen mother, afterwards lived in it for a time with her young son, Louis XIV. It subsequently became the town residence of the Orleans branch of the Bourbons, and during the minority of Louis XV. it acquired a scandalous notoriety as the scene of the wild orgies in which

the regent, duke of Orleans, and his dissolute partisans were wont to indulge; while in the time of his son, Philippe Egalité, it became the focus of revolutionary intrigue, and the rendezvous for political demagogues of every shade of opinion. This prince, partly to repair his impoverished fortune and partly to persuade the sans-culottes of Paris of the sincerity of his professed sympathy with their striving for equality, converted part of his gardens into a place of public resort, and the pavilions of the great court into bazaars, which were divided into shops and stalls. On the downfall of Egalité the palais royal was taken possession of by the republican government, and used for the sittings of the tribunes during the reign of terror. On the restoration of the Bourbons, it reverted to the Orleans family, and was occupied by Louis Philippe till his election to the throne of France in 1830, when it was incorporated in the general domains of the state, and ceased to be an appanage of the house of Orleans. The palace was sacked by the mob during the revolution of 1848, when many of its best paintings and most precious works of art were destroyed. After having been temporarily appropriated to various public purposes, it was thoroughly repaired and magnificently furnished, and given by the late emperor, in 1855, to his uncle, Jerome Bonaparte , whose son, Prince Napoleon, resided there until 1871. The main entrance, with its elegant façade, is in the rue St. Honoré; and on passing through the first court, the second or Cour Royale is reached, to the left of which stands the Théâtre Francais, while immediately facing it is the celebrated Galerie Vitr´e, or glass gallery, which contains on the ground floor some of the most brilliant shops of Paris, while the upper stories are chiefly occupied by cafés and restaurants. The garden, which is surrounded by this and other galleries, measures 700 ft. by 300. The red republicans set fire to the palace in Mar., 1871 (see PARIS), when all the apartments occupied by Prince Napoleon were destroyed. The firemen and those who aided them, while forming into line to pass buckets of water, were fired upon by the insurgents, but kept to their work, and succeeded in checking the flames before they spread to the galleries and shops, which may almost be said to have remained intact. In the autumn of 1873 that part of the palace injured by the insurgents was restored. The garden, with its avenues and parterres, fountains, and grass plots, still constitutes one of the liveliest and most frequented spots in the whole city; and although much of their glory has faded, its cafés still maintain, in great measure, the world-wide reputation they long ago acquired.

PALAME'DES, a Grecian hero, son of Nauplius and Clymene. He was the prince whom the Greeks deputed to induce Ulysses to join in the war against Troy, but his stratagem, by which he exposed the pretended insanity of Ulysses, produced an irreconcilable enmity between them. He was for a time commander-in-chief in place of Agamemnon. His death is attributed to Ulysses, in revenge, who accused him of treason: as to its modes, there are various traditions.

PALAMEDI'DÆ, a family of birds, somewhat resembling the ducks (*anatidæ*) and also the rails (*rallidæ*). Feet very large, neck short, head small, bill short, nostrils large; wings large and armed at the shoulder with two strong spurs; tail small, legs large and covered with hexagonal scales; toes long, three before and one behind; the anterior toes connected by slight, scaly webs. Family includes two genera, *palamedea*, with one species, and *chaunæ*, with two species. They are natives of South America, inhabiting marshy grounds and borders of lakes and rivers.

PALANQUIN, or PALKI, the vehicle commonly used in Hindustan by travelers, is a wooden box, about 8 ft. long, 4 ft. wide, and 4 ft. high, with wooden shutters which can be opened or shut at pleasure, and constructed like Venetian blinds for the purpose of admitting fresh air, while at the same time they exclude the scorching rays of the sun, and the heavy showers of rain so common in that country. The furniture of the interior consists of a cocoa mattress, well stuffed and covered with morocco leather, on which the traveler reclines; two small bolsters are placed under his head, and one under his thighs, to render his position as comfortable as possible. At the upper end is a shelf and drawer and at the sides are nettings of larger dimensions than the ordinary pockets in carriages, for containing those articles which may be necessary to the traveler during his journey. At each end of the palanquin, on the outside, two iron rings are fixed, and the *hammals*, or palanquin-bearers, of whom there are four, two at each end, support the palanquin by a pole passing through these rings. Traveling in this mode is continued both by day and night. (See DAWK.) The palanquin is also used at the present day in Brazil, with the prominent exception of Rio Janeiro.

Similar modes of traveling have been at various times in use in western Europe, but only for short distances. The Roman "litter," the French "chaise a porteurs," and the "sedan-chair" were the forms of vehicle most in use, and the two latter were in general use in towns till they were superseded by hackney coaches. The Roman "litter" was one of the criteria of its owner's wealth, the rich man generally exhibiting the prosperous condition of his affairs by the multitude of the bearers and other attendants accompanying him.

PALAPTERYX (Gr. an. apteryx), a genus of fossil birds whose remains are found in the river-silt deposits of New Zealand, associated with the gigantic dinornis, and which, like it, resembled in the form of the sternum, and the structure of the pelvis and legs, the living wingless apteryx. Two species have been described.

PALATE, THE, forms the roof of the mouth, and consists of two portions, the hard palate in front and the soft palate behind. The framework of the *hard palate* is formed by the palate process of the superior maxillary bone, and by the horizontal process of the palate bone, and is bounded in front and at the sides by the alveolar arches and gums, and posteriorly it is continuous with the soft palate. It is covered by a dense structure formed by the periosteum and mucous membrane of the mouth, which are closely adherent. Along the middle line is a linear ridge or raphe, on either side of which the mucous membrane is thick, pale, and corrugated, while behind it is thin, of a darker tint, and smooth. This membrane is covered with scaly epithelium, and is furnished with numerous follicles (the palatal glands). The *soft palate* is a movable fold of mucous membrane inclosing muscular fibers, and suspended from the posterior border of the hard palate so as to form an incomplete septum between the mouth and the pharynx; its sides being blended with the pharynx, while its lower border is free. When occupying its usual position (that is to say, when the muscular fibers contained in it are relaxed), its anterior surface is concave; and when its muscles are called into action, as in swallowing a morsel of food, it is raised and made tense, and the food is thus prevented from passing into the posterior nares, and is at the same time directed obliquely backwards and downwards into the pharynx.

Hanging from the middle of its lower border is a small conical pendulous process, the *uvula;* and passing outwards from the uvula on each side are two curved folds of mucous membrane containing muscular fibers, and called the *arches* or *pillars of the soft palate.* The *anterior pillar* is continued downwards to the side of the base of the tongue, and is formed by the projection of the palato-glossus muscle. The *posterior pillar* is larger than the anterior, and runs downwards and backwards to the side of the pharynx. The anterior and posterior pillars are closely united above, but are separated below by an angular interval, in which the *tonsil* of either side is lodged. The tonsils (*amygdalæ*) are glandular organs of a rounded form, which vary considerably in size in different individuals. They are composed of an assemblage of mucous follicles, which secrete a thick, grayish matter, and open on the surface of the gland by numerous (12 to 15) orifices.

The space left between the arches of the palate on the two sides is called the *isthmus of the fauces.* It is bounded above by the free margin of the palate, below by the tongue, and on each side by the pillars of the soft palate and tonsils.

As the upper lip may be fissured through imperfect development (in which case it presents the condition known as the hare-lip), so also may there be more or less decided fissure of the palate. In the slightest form of this affection, the uvula merely is fissured, while in extreme cases the cleft extends through both the soft and hard palate as far forward as the lips, and is then often combined with hare-lip. When the fissure is considerable, it materially interferes with the acts of sucking and swallowing, and the infant runs a great risk of being starved; and if the child grows up, its articulation is painfully indistinct. When the fissure is confined to the soft palate, repeated cauterization of the angle of the fissure has been found sufficient to effect a cure by means of the contraction that follows each burn. As a general rule, however, the child is allowed to reach the age of puberty when the operation of *staphyloraphy* (or suture of the soft parts) is performed—an operation always difficult, and not always successful. For the method of performing it, the reader is referred to the *Practical Surgery* of Mr. Fergusson, who has introduced several most important modifications into the old operation.

Acute inflammation of the tonsils, popularly known as QUINSY, is treated of in a separate article.

Chronic enlargement of the tonsils is very frequent in scrofulous children, and is not rare in scrofulous persons of more advanced age, and may give rise to very considerable inconvenience and distress. It may occasion difficulty in swallowing, confused and inarticulate speech, deafness in various degrees from closure of the eustachian tubes (now often termed *throat deafness*), and noisy and laborious respiration, especially during sleep; and it may even cause death by suffocation, induced by the entanglement of viscid mucus between the enlarged glands. Iodide of iron (especially in the form of Blancard's pills) and cod-liver oil are the medicines upon whose action most reliance should be placed in these cases, while a strong solution of nitrate of silver (a scruple of the salt to an ounce of distilled water), or some preparation of iodine, should be applied once a day to the affected parts. If these measures fail, the tonsils must be more or less removed by the surgeon, either by the knife or scissors, or by a small *guillotine* specially invented for the purpose.

Enlargement or relaxation of the uvula is not uncommon, and gives rise to a constant tickling cough, and to expectoration, by the irritation of the larynx which it occasions. If it will not yield to astringent or stimulating gargles, or to the stronger local applications directed for enlarged tonsils, its extremity must be seized with the forceps, and it must be divided through the middle with a pair of long scissors.

PALATINATE, a name applied to two German states, which were united previously to the year 1620. They were distinguished as the Upper and Lower Palatinate. The Upper or Bavarian Palatinate, now forming a circle of the kingdom of Bavaria, was a duchy, and was bounded by Baireuth, Bohemia, Neuburg, Bavaria, and the district of

Nürnberg. Area, 2,830 sq.m.; pop. 1807, 283,800. Amberg was the chief city, and the seat of government. The Lower Palatinate or the Palatinate on the Rhine, embraced an area of from 3,045 to 3,150 sq.m.; and consisted of the electoral Palatinate, the principality of Simmern, the duchy of Zweibrücken, the half of the county of Sponheim, and the principalities of Beldenz and Lautern. For the area and population of the modern provinces of the Upper and Lower Palatinate, see article BAVARIA.

The counts of the electoral or Rhenish Palatinate were established in the hereditary possession of the territory of that name, and of the lands attached to it, as early as the 11th century. After the death of Herman III., the emperor Friedrich I. assigned the Palatinate to Conrad of Swabia. After Conrad's death, his son-in-law, duke Henry of Brunswick, came, in 1196, into the possession of these lands, but he, having been outlawed in 1215 by Friedrich II., was succeeded by his son, Otto III., duke of Bavaria. Ludwig II., or the Strong, succeeded the preceding in the Palatinate in 1253, and was in turn succeeded in 1294 by Rudolf I., who, however, was banished by his brother, the emperor Ludwig, because he had taken part with Friedrich of Austria. The country was ruled by his three sons. Ruprecht III., who died in 1410, was a German emperor. Of his four sons, Ludwig III. received the electoral or Rhenish Palatinate, Johann, the Upper Palatinate; Stephan, Zweibrücken; and Otto, Mosbach. The second and fourth lines soon died out, as well as also that of Ludwig III., which came to a close in 1559, upon which the possessions of that prince, together with the electorate, passed to Friedrich III. of the Simmern line. He was succeeded by Ludwig IV. in 1576, by Friedrich IV. in 1583, and by Friedrich V. in 1610, who, after he accepted the Bohemian crown, was driven from his possessions by the emperor in 1619, and his office of elector was transferred to Maximilian, duke of Bavaria. Karl Ludwig, son of Friedrich V. received the Lower Palatinate at the peace of Westphalia, and in his favor a new or eighth electorship was created. With his son Karl, the Simmern line terminated in 1685, upon which the Palatinate fell into the hands of Philipp Wilhelm, count palatine of Neuburg.

The house of Neuburg was descended from Ludwig the Black, count palatine in Zweibrücken, second son of Stephan, count palatine in Simmern. Wolfgang, a descendant of Ludwig's, was the founder of all the other lines of counts palatine. Of his three sons, Johann founded the line of Neu-Zweibrücken, Karl the Birkenfeld line, Philipp Ludwig the Neuburg line. Philipp Ludwig had three sons, Wolfgang Wilhelm, August, and Johann Friedrich. The first founded the Neuburg line, the second the Sulzbach line, the third died childless. The son of Wolfgang Wilhelm died in 1690. His son, Johann Wilhelm, became heir to the Beldenz line in 1694. He was succeeded by his brother, Karl Phillip, who in turn was succeeded in 1742 by Karl Theodor, from the Sulzbach line, who united the Bavarian territories with the Palatinate. Duke Maximillian of Zweibrücken next succeeded in 1799, who at the peace of Luneville (1801) was compelled to cede a portion of the Rhenish Palatinate to France, a part to Baden, a part to Hesse-Darmstadt, and a part to Nassau. Treaties of Paris of 1814 and 1815 re-assigned the Palatinate lands beyond the Rhine to Germany, Bavaria receiving the largest share, and the remainder being divided between Hesse-Darmstadt and Prussia.

PALATINE (from Lat. *palatium*, a palace). A *Comes Palatinus*, or count Palatine, was under the Merovingian kings of France, a high judicial officer, who had supreme authority in all causes that came under the immediate cognizance of the sovereign. After the time of Charlemagne a similar title was given to any powerful feudal lord, to whom a province, generally near the frontier, was made over with *jura regalia*, or judicial powers, similar to what the counts palatine had received in the palace, and the district so governed was called a *palatinate* or *county palatine*. There were three counties palatine in England—Lancaster, Chester, and Durham—which were, no doubt, made separate regalities on account of their respective proximity to the frontier of Wales and to that turbulent Northumbrian province which could neither be accounted a portion of England nor of Scotland. In virtue of their regal rights, the counts palatine had their courts of law, appointed their judges and law officers, and could pardon treasons, murders, and felonies; all writs and judicial process proceeded in their names, and the king's writs were of no avail within the bounds of the palatinate. Lancaster seems to have been made a county palatine by Edward III. Henry, first duke, and John, second duke of Lancaster, were both invested by him with the dignity of count palatine. Henry VI. was hereditarily duke and count palatine of Lancaster, and on his attainder, soon after Edward IV.'s accession, the duchy and county were forfeited to the crown, and confirmed on Edward IV.—afterward on Henry VII, and his heirs forever. The queen is now duchess and countess palatine of Lancaster. There is still a chancellor of the duchy and county palatine, whose duties are few and unimportant, but the administration of justice has gradually been assimilated to that of the rest of England. See LANCASTER. Chester is supposed to have become a county palatine when made over with regal jurisdiction by William the Conqueror to Hugues d'Avranches. In the reign of Henry III. it was annexed to the crown by letters patent, and since that time the earldom palatine of Chester has been vested in the eldest son of the sovereign, or in the crown, whenever there is no Prince of Wales. Durham seems to have first become a palatinate when William the Conqueror constituted bishop Walcher, bishop and duke of Durham, with power (according to William of Malmesbury) to restrain the rebellious people with the sword, and

reform their morals with his eloquence. The palatinate jurisdiction continued united with the bishopric till 1836, when it was separated by act of parliament, and vested in William IV. and his successors as a franchise distinct from the crown, together with all forfeitures, mines, and *jura regalia*. It has since been more completely incorporated with the crown. Pembroke was at one time a county palatine, but ceased to be so in Henry VIII.'s time. The archbishop of York also exercised the powers of a palatine in the county of Hexham in Northumberland, of which he was deprived in the reign of Elizabeth. In very early times there were a number of similar privileges in Scotland, the most important of which was that of the earls palatine of Strathern. In Germany, the *Pfalzgraf*, or count palatine, exercised a jurisdiction much more extensive than the simple *Graf* or count. A considerable district in Germany was long under the jurisdiction of a count palatine, who was one of the electors of the empire. See PALATINATE.

PALATINE, a town in Montgomery co., N. Y., consisting of the villages of Palatine Bridge and Nelliston. Of these the largest is Palatine Bridge on the n. bank of the Mohawk river, and a station on the New York Central and Hudson River railroad. There is a manufactory of thrashing machines, a foundry, a high school, and (in the town) several churches. Pop. '90, town, 2876.

PALATINE HILL, *Mons Palatinus*, the central hill of the famous seven on which ancient Rome was built, and, according to tradition, the seat of the earliest Roman settlements. In point of historical interest, it ranks next to the capitol and the forum. Its summit is about 160 ft. above the sea. The form of the hill is irregularly quadrangular. Its north-western slope, towards the Capitoline hill and the Tiber, was called *Germalus* or *Cermalus*. The origin of the name is uncertain, although several derivations are given connecting it with legendary stories. Romulus is said to have founded the city upon this hill, and on Germalus grew the sacred fig-tree (near to the Lupercal) under which he and his brother, Remus, were found sucking the she-wolf. Upon the Palatine hill were the temple of Jupiter *Stator*, the temple of Cybele, the sacred square inclosure called *Roma quadrata*, and other sacred places and edifices, besides many of the finest houses in Rome. Augustus and Tiberius had their residences here, whence Tacitus termed it *ipsa imperii arx* (the very citadel of government); and at last Nero included it entirely within the precincts of his *aurea domus*, which Vespasian subsequently restricted to the hill. From the time of Alexander Severus it ceased to be the residence of the emperors, but the name *palace* (*palatium*), derived from it, was given to the abodes of sovereigns and great princes, and has been adopted into modern languages. Recent excavations have brought to light numerous remains of the palatial and other structures with which the Palatine hill was once covered; and these are now among the most interesting sights of the Eternal City.

PALAWAN, or PARAGOA, one of the Philippine islands (q.v.).

PALAY, *Cryptostegia grandiflora*, a climbing plant of the natural order *asclepiadaceæ* (q.v.), common in many parts of India, particularly on the eastern coast of Hindustan. It yields a very fine strong white fiber, resembling flax, and which can be spun into the finest yarn. The fiber is obtained from the stalk; the milky juice contains caoutchouc. Palay is one of the most interesting plants which have recently been recommended to notice in India.

PALAZ'ZOLO ACREI'DE, a t. of Sicily, in the province of Syracuse, 22 m. w. of Syracuse, is situated on the brow of a hill, just where it overhangs a deep valley. Near Palazzolo Acreide are the remains of the ancient *Acræ*, founded by a colony from Syracuse, on the site of a Phenician settlement, 664 B.C. The most curious remains are to be found in some low cliffs beneath the town to the s., where is a series of arched niches, containing figures carved in high relief in the rock. The style of art appears to be archaic Greek, with somewhat of an Egyptian character. Pop. 11,200.

PALE, in heraldry, one of the figures known as ordinaries, consisting of a perpendicular band in the middle of the shield, of which it is said to occupy one-third. Several charges of any kind are said to be "in pale" when they stand over each other perpendicularly, as do the three lions of England. A shield divided through the middle by a perpendicular line is said to be "parted per pale." The pallet is the diminutive of the pale, and is most generally not borne singly. Or three pallets gules were the arms of Raymond, count of Provence. When the field is divided into an even number of parts by perpendicular lines, it is called "paly of" so many pieces. Paly of six argent and gules, the arms of the family of Ruthven. When divided by lines perpendicular and bendways crossing, it is called paly bendy. An indorse is a further diminutive of the pallet, and a pale placed between two indorses is said to be indorsed.

PALE, in Irish history (see IRELAND, HISTORY), means that portion of the kingdom over which the English rule and English law was acknowledged. There is so much vagueness in the meaning of the term that a few words of explanation appear necessary. The vagueness arises from the great fluctuations which the English authority underwent in Ireland at various periods, and from the consequent fluctuation of the actual territorial limits of the pale. The designation dates from the reign of John, who distributed the portion of Ireland then nominally subject to England into twelve counties palatine, Dublin, Meath, Kildare, Louth, Carlow, Kilkenny, Wexford, Waterford, Cork, Kerry,

Tipperary, and Limerick. To this entire district, in a general way, was afterwards given the designation of the Pale. But, as it may be said that the term is commonly applied by the writers of each age to the actual English territory of the period, and as this varied very much, care must be taken to allude to the age of which the name Pale is used. Thus, very soon after the important date of the statute of Kilkenny, at the close of the reign of Edward III., the English law extended only to the four counties of Dublin, Carlow, Meath, and Louth. In the reign of Henry VI. the limits were still further restricted. In a general way, however, the Pale may be considered as comprising the counties of Dublin, Meath, Carlow, Kilkenny, and Louth. This, although not quite exact, will be sufficient for most purposes.

PA'LEA (Lat. chaff), a term employed in botany to designate the bracts of the *florets* in grasses (q.v.), called *corolla* by the older botanists; also to designate the small bracts or scales which are attached to the receptacle of the head of flowers in many of the *compositæ* (q.v.). Any part of a plant covered with chaffy scales is described as *paleaceous*.

PALEAS'TER (Gr. ancient star-fish), a genus of star-fish peculiar to the Silurian period, which in general appearance resemble the living brittle stars, but when more minutely examined present so many anomalies that they cannot be referred to any existing family. Five or six species have been described.

PALEFITS. See Lake Dwellings.

PALEMBANG', formerly an independent kingdom on the e. coast of Sumatra; now a Netherlands residency, is bounded on the n. by Djambi, n.w. by Bencoolen, s. by the Lampong districts, and s.e. by the strait of Banca, has an area of 53,497 sq.m.; and a population amounting, in 1894, to 694,613 souls. Much of the land is low-lying swamp, covered with a wilderness of impenetrable bush; but in the s. it rises into mountains, of which Oeloe Moesi (Ulu Musi) is 6,180 feet. Gold-dust, iron-ore, sulphur with arsenic, lignite, and common coal are found; also clays suited for making coarse pottery, etc. Springs of pure oil occur near the coal-fields of Bali Boekit (Bukit), and of mineral water in various places. Rice, cotton, sugar, pepper, tobacco, and, in the interior, cocoanuts, are grown; the forests producing gutta-percha, gum-elastic, rattans, wax, benzoin, satin-wood, etc. The rivers abound with fish; and the elephant, rhinoceros, tiger, panther, and leopard roam the woods, as well as the deer, wild swine, and goats, with many varieties of the monkey.

In the dry season the thermometer ranges from 80° to 92° F., and in the rainy season 76° to 80°. The climate is not unhealthy, except in the neighborhood of the swamps. The natives are descended from Javanese, who in the 16th c., or earlier, settled in Palembang, and ruled over the whole land. The race, however, has become mixed with other Malays, and the language has lost its purity. In the n.w. interior is a tribe called the Koeboes (Kūbūs), of whose origin nothing is known, but who are probably the remainder of the aborigines. They do not follow after agriculture, go about almost naked, and live chiefly by fishing and hunting. No idea of a supreme being seems to be possessed by them, though they believe in existence after death.

PALEMBANG, the capital of the kingdom and residency, is 60 m. from the Soensang (Sunsang), or principal mouth of the river Moesi (Musi), in 2° 59′ s. lat., and 104° 45′ e. longitude. The city is built on both banks of the Moesi, and other streams which fall into it, and is 5 m. in length by ½ m. in breadth. The river is upwards of 1,000 ft. broad, and from 40 to 50 ft. in depth, so that the largest vessels can sail up to the harbor. The native houses are raised on posts and neatly constructed of planks or bamboos; the Chinese, Arabians, and Europeans, chiefly living in floating houses called rakits, of which there are upwards of 500, and holding communication with one another and with the natives by boats. The fort is built on the left bank of the river, and behind it are an institution for the blind and a splendid mosque. There is a school, where 30 European children are educated, a government elementary school for natives, and several good Chinese schools. Many of the natives can read and write, and in 1856 a native printing press was erected by Kemas Mohammed Asahel.

Palembang is visited annually by upwards of 30,000 boats of various sizes, bringing produce from the interior, consisting chiefly of rice, benzoin, gum-elastic, gutta-percha, raw cotton, rattans, tobacco, pepper, wax, dragon's blood, resin; and gold-dust from the boundaries of the kingdom of Djambi, now included in the residency. These are obtained chiefly in exchange for salt, cotton manufactures, earthenware, iron and copper wares, and provisions. The foreign trade is large, and chiefly carried on with Java, and China. The natives of Palembang are good ivory carvers, gold and silver smiths, jewelers, cutlers, japanners, painters, boat-builders, bookbinders, etc., and expert at all the ordinary handicrafts. The women, in addition to cotton fabrics, spinning, and dyeing, weave silk stuffs embroidered with gold. Pop. 55,000, of whom about 100 are Europeans, 3,000 Chinese, and 2,000 Arabians.

PALENCIA, a province in n.w. Spain, bounded on the n. by Santander, on the e. by Burgos, on the s. by Valladolid, and on the w. by Burgos; 3126 sq. m.; pop. 188,845. The surface is level, except in the n. where it is mountainous. There are few trees. It

is watered by the Pisuerga, Carrion, Camera, and other rivers. The soil is fertile and produces wheat, hemp, and flax. Other staples are fruit and linseed oil. Minerals abound, but only coal is mined to any extent. Grain is exported on the canal of Castile which passes through the province from n. to south. The principal manufacture is flour; blankets, baize, and serge also are made. There is a good system of elementary schools. Capital, Palencia.

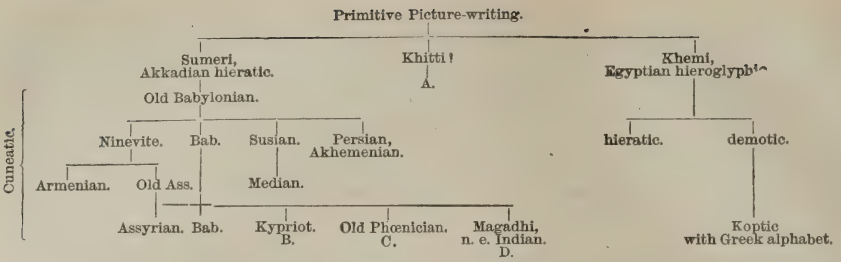
PALENCIA (the ancient *Pallantia*), a city of Spain, in Old Castile, capital of the modern province of the same name, stands in a treeless, but well-watered and fruitful plain, on the Carrion, 39 m. n.e. of Valladolid. It is a bishop's see, and is surrounded by old walls, 36 ft. high and 9 ft. thick, around which are pleasant promenades. The cathedral, a light and elegant Gothic edifice, was built 1321–1504. The first university founded in Castile was built here in the 10th c., but was removed to Salamanca in 1239. Nearly one-third of the population is employed in the manufacture of blankets and coarse woolen cloths. The position of the town on the Carrion, and on the Castilian canal, is favorable to the development of commerce. The vine is cultivated, and there is a good trade in wool. Pop. comm. 15,100.

PALENQUÉ, Ruins of, are on the Rio Chacamas, a branch of the river Usumasinta, in the state of Chiapas, Mexico, 8 m. s.e. of the village of Santo Domingo de Palenque, lat. 17° 30′ n., long. 92° 26′ west. The ruins extend over a large area, covered with a dense tropical forest, and are of difficult exploration. They consist of vast artificial terraces, or terraced truncated pyramids, of cut stone, surmounted by edifices of peculiar and solid architecture, also of cut stone, covered with figures in relief, or figures and hieroglyphics in stucco, with remains of brilliant colors. Most of the buildings are of one story, but a few are two, three, and some may have been four stories. The principal structure, known as the palace, is 228 ft. long, 180 ft. deep, and 25 ft. high, standing on a terraced truncated pyramid of corresponding dimensions. It was faced with cut stone, cemented with mortar of lime and sand, and the front covered with stucco and painted. A corridor runs around the building, opening into four interior courts, which open into many smaller rooms. On slabs of stone are carved numerous colossal figures, and the remains of statues more resemble Grecian than Egyptian or Hindu art. Other spacious and elaborately ornamented buildings appear to have been temples of religion. These ruins were in the same condition when Cortez conquered Mexico, as now, overgrown with a forest, and their site forgotten. They were only discovered in 1750. Three explorations were made by the Spanish government, but they were little known until visited by Messrs. J. L. Stephens and F. Catherwood, and their account published with plans and drawings. See Stephens's *Incidents of Travel in Central America*, etc., and Catherwood's *Views of Ancient Monuments of Central America*, etc. There are in Mexico dim traditions of the existence, at a remote period, of the capital of a theocratic state, the center of a long since extinguished civilization, of which the only traces are these wonderful ruins and unexplained hieroglyphics.

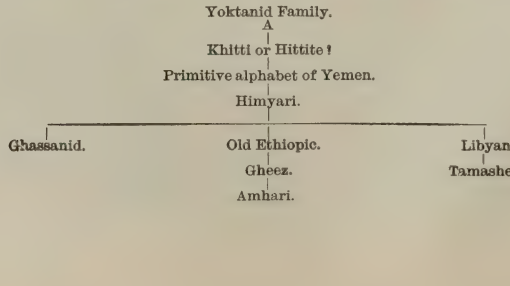
PALEOGRAPHY (Gr. *palaios*, old, and *graphé*, writing), the science of ancient writings. It comprehends not merely the art of reading them, but such a critical knowledge of all their circumstances as will serve to determine their age, if they happen to be undated, and their genuineness, in the absence of any formal authentication. For these purposes, the paleographer needs to be acquainted with the various substances, such as bark, leaves, skins, paper, etc., which have been used for writing; with the various manners of writing which have prevailed, and the changes which they have undergone; with the various forms of authenticating writings, such as seals, signets, cachets, signatures, superscriptions, subscriptions, attestations, etc., which have been employed at different times; with the various phases through which the grammar, vocabulary, and orthography of the language of the writing with which he is dealing, has passed; and with more or less, as the case may be, of the history, laws, institutions, literature, and art of the age and country to which the writing professes to belong.

Paleography may be said to have been founded by the learned French Benedictine, Jean Mabillon, whose *De Re Diplomatica*, first published in 1681 in 1 vol. fol., reprinted in 1709, and again in 1789, in 2 vols. fol., is still, perhaps, the most masterly work on the subject. Along with the *Nouveau Traité de Diplomatique* (Par. 1750–65, 6 vols. 4to) of the Benedictines of St. Maur, and the *Eléments de Paléographie* (Par. 1838, 2 vols. 4to) by M. Natalis de Wailly, it is the great authority for French paleography. English paleography is perhaps less favorably represented in Astle's *Origin and Progress of Writing* (Lond. 1803) than Scottish paleography in Anderson's and Ruddiman's *Diplomata Scotiæ* (Edin. 1739). Muratori treats of Italian paleography in the third volume of his great work, the *Antiquitates Italicæ Medii Ævi;* and among later works on the same subject may be mentioned the *Diplomatica Pontificia* (Rome, 1841) of Marino Marini. The paleography of Greece is illustrated in the *Paleographia Græca* (Par. 1708) of Montfaucon. Spanish palæography may be studied in the *Bibliotheca de la Polygraphia Espanola* (Mad. 1738) of Don C. Rodriguez. Of works on German paleography, it may be enough to name Eckard's *Introductio in Rem Diplomaticam* (Jen. 1742), Heumann's *Commentarii de Re Diplomatica* (Norimb. 1745), Walther's *Lexicon Diplomaticum* (Gott. 1745), and Kopp's *Palæographia Critica* (Manh. 1817). Hebrew paleography has been elaborated by Gesenius in his *Geschichte der Hebräischen Sprache und Schrift*, and

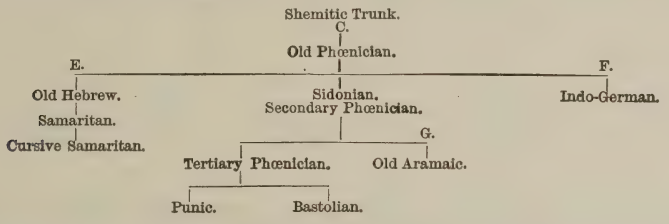
other works. The great work on paleography generally—one of the most sumptuous works of its class ever published—is the *Paléographie Universelle* (Par. 1839–45, in 5 vols. fol) of M. J. B. Silvestre. Modern paleography, since the simultaneous reading of the cuneatic Persian by Rawlinson, Lassen, and Burnouf, in 1836, lies at the bottom of all that exact and laborious criticism which in thirty years enabled the entire history of antiquity to be rewritten from a linguistic and archæological point of view. The whole subject turns on an intimate acquaintance with the most minute points in the history of whatever people may be under discussion. Back of all is the real living feeling of that people, as shown in their remains—that is, their inscriptions. Having a series of inscriptions, granted in an unknown alphabet, the first thing is to verify the copies, an exceedingly difficult operation, since every scholar knows it is impossible to correctly copy writing not understood. Recourse should be had, when reachable, to rubbing with heel-ball, to squeezes in paper or clay, to casts, and to photography. The approximate date of each should then be ascertained, the place of its "find," the date of the find, and a *proces-verbal* of its exact location, most especially with regard to ground-level or later constructions. No duplicates or comparative collations should be made without these, and they should always be affixed to the original and printed in essays. The Kypriot texts of Moritz Schmitt are almost useless from neglect of these evident rules, which apply with equal force to MSS., where the experienced eye notices a hundred details all tending to approximate the date of fabrication. Next comes the correction of the text. No man can correct an inscription until he understands the grammar of its language, and the grammar of a language is tabulated only from a thousand examples. A whole generation of German scholars battered their brains over the reading of the Malperg glosses, and utter failure resulted even to Grimm from neglect of the ordinary processes of analysis. The mistakes in a text usually arise from three causes: from dialect; from literal resemblances; from ignorant copyists. There is an enormous mass of pedantic analysis wasted on old English and old German spelling, which, on correction by three known systems—Saxon, Norse, and Gothic—shows differences neither abnormal nor arbitrary. A letter, like every creation in form, depends upon three things: the intention, the capacity, and the material. Letters may be successively analyzed as: *a*, imitative—a picture of the thing thought of; *b*, conventional—a change in shape for quickness or convenience which recalls little or not at all the original picture; *c*, symbolical—they become signs, and subject, as puns, metaphors, or similes, to all the turns of human wit or wisdom. It follows that they get a double meaning to one sound, or a double sound to one meaning; or, new sounds being evolved, new characters are created as, *d*, explanatory—generally abbreviations of other characters, or a change, by altering shape or affixing marks; lastly they become, *e*, traditional—in which case the original generation is forgotten and the character is arbitrarily connected with a given object. They decrease from signs of words to signs of syllables, to sounds of syllables, to sounds of letters merely, to silent indications of an extinct letter. The actual form of a sign, in one of these successive states, depends on the other original two conditions—the material and the tool in use. If in a hard stone they will be chiseled square; if in a soft, rounded, usually sunk, but occasionally in relief or intaglio-relief. This must have been preceded by scratching on stone, carving in wood, stamping or picking in clay, and painting or stenciling on a surface. Many eastern alphabets are written across the fiber of dry, hard leaves, and are usually minute and crumpled. Characters in soft clay or wax are legible and rounded. The invention of ink involves a brush, which gives a peculiar flowing look, or a reed pen, or a quill, whether for square or cursive characters, or the abomination of the artist—a steel-pen, with all the thick and thin lines of modern script. Stamped letters, for embossing or gilding, naturally led to block type, and they to separate type. The kinds of type in use in ornamental English printing are almost 100, yet each has a history and a reason. In regard to the method of writing, letters may go from left to right, direct; or right to left, reverse; or back and forth, woven; or from top to bottom, in columns. Some few occasionally go above or below another letter, and many abbreviate by contractions or monograms. The letters may occur in a syllabary, or in a vowelic syllabary, where each letter adds for a different vowel a hook or a tail; or they may be alphabetic, with vowels expressed, *scriptio plena*, or with vowels understood, scriptio defectiva. The letters may be all capitals, uncial, or with small letters (almost always different), minuscles; they may be connected by a bar at top, bottom, or middle, or with each other, cursive. Finally, they may be accented, pointed, or with hooks attached, apices. Words are not always separated, and letters often vary in shape when occurring as initial, medial, or final. The earliest efforts at signs are tallies, still found in the Egyptian and Chinese numbers; the origin of the Chinese and several American systems is unknown to us; there are two or three systems known to be self-invented in modern times, and one or two, like the Lepcha or Ron of the Himalayas, and the running runes of the Danes and Celts (oghams), cannot be distinctly connected with a known alphabet. With these exceptions all systems known are traceable to one common center, but so lately has it been possible to assert this that Lenormant's *Spread of the Phœnician Alphabet*, first edition in 1868, and the best authority for the central Asiatic paleography, must be rewritten.



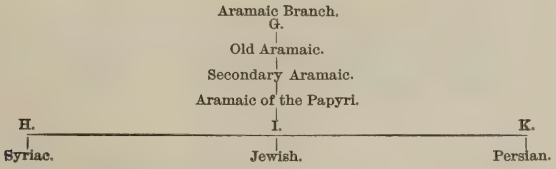
At a time so remote as to antedate all remains of Egyptian civilization, a writing of the true pictorial type seems to have suggested the systems of three different races—Egyptians, who may have been African and Indo-German; the men of the center of Arabia—Shemites; and the men of the Tigris valley, apparently Uraltaic. The identity of origin, necessarily difficult to prove where the deductions result very differently, and where the sign has a different meaning in four languages, is inferred from the choice of the same thing to represent the same metaphor, and from the identity of secondary forms throughout. The accepted derivation of Phœnician from XVIII. dynasty hieratic is wrongly based on a necessary resemblance; both are the conventional representations of the same thing, but by far-separated routes. For latest collations of cuneatic and Shemitic, see Deecke, Z.M.G. The hieroglyphs are true word-pictures, and the language being one-syllabled they change into alphabetic. The writing is chiseled, direct or columnar, with always a determinative sign. The hieratic or priests' system, modified about the time of the Hyksos, is a graphic variety of the same, reversed, written with a brush on linen or papyrus. The demotic, in another dialect, direct, quickly formed, finally becomes cursive. The hieroglyphs were still read in Trajan's time, and a bastard demotic was written long after the Arab conquest. The Greeks of Alexandria introduced a beautiful graphic variety of the Greek alphabet, and, written direct, with 6 demotic signs added, it served as the vehicle of a living dialect of Egyptian till modern times. The third race, that best known to us as Accadian, leaves its first records of the 20 c. B.C. (?) in a few names of kings on bricks, on stone, on seals. Very quickly the character, a singular series of outline pictures, syllabic, direct, with determinative signs, appears accompanied by an east Shemitic idiom, the Babylonian; and the signs are composed of many lines each in shape of an arrow or wedge, whence the name, cuneiform, or better cuneatic, for all such inscriptions. Now follow a northern dialect, that of Nineveh, with fewer lines to the signs and a growing syllabary; the Babylonian continues; the mountaineers to the north-east, not Shemites nor Aryans, borrowed a distorted copy, the Susian; and lastly, the Persian or, as we now know it, the Bactrian, makes an alphabet of forty curtailed and legible characters, with almost no determinative signs—an alphabet thereafter to record the glories of the conquerors of Greece. From the Ninevite comes the rude and scanty Armenian of Van, hardly yet enough deciphered to be classified as to language; the old Assyrian commences, the fine clear-cut language of the old inscriptions and gems; the Babylonian soon falls under its power, but still continues for local use; and from the Susian, apparently, but with traces of all, is generated still a new system, that of the Uraltaic Medes. All thus far are cuneatic, all are direct, and all divide their words. The Assyrian, first in glory and spread in the 10th c. B.C., is the first of all Shemitic languages to generate a regular syllabary of twenty-two letters; but this itself bears traces of a late arrangement, and only thirteen of them appear in full form. After the fall of the Assyrian empire, the Babylonian character, debased and with more or less Assyrian influence, continues to be written until the Sassanian era, changing also in dialect to Aramaic. But from the true standard cuneatic syllabary are gendered, at some date probably long preceding the 10th c. B.C., a new series of systems no longer cuneatic, but more or less approaching to the type of our own letter. One of these, B, the Kypriot, only lately deciphered, has a syllabary of four vowels in combination with ten consonants, occurs as an antiquated Greek dialect in connection with pure Greek and Phœnician inscriptions, principally in Cyprus, and supposedly as late as the times of Alexander. It remains to speak of the third or center variety of the three early types, the



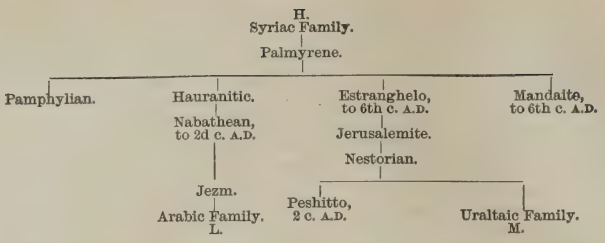
The original inhabitants of the center of Arabia—in Hebrew, B'nai Yuktan; in Arabic Beni Kahtan—have long spread from the n.w., touching Palestine as far s. as Nubia, and w. to Barbary. We have called them doubtfully Khittim or Hittites, though the Bible name would indicate Cyprus as one of their colonies, and identification is hindered by our not knowing who the Hittites were, nor what language they spoke. At any rate, Ramses II. found them in Palestine, and they then had scribes. The curious inscribed stones of Hamath appear to belong to the center or Himyari variety of letter; and the western, the Ghassani, has been found mixed with late Moabite legends. The Himyari, the Musnad of Arabic writers, was supplanted in the s. of Arabia by the modern Arabic. It adds 6 letters to the Phœnician, and is a curious humped kind of alphabet, written reversed or woven. The Gheez, extinct in the 4th c. A.D., is an enormous syllabary of 33 letters, combined by differentiation with 6 vowels and with additional diphthongs. The other divisions are the old and the new systems of the Barbary tribes. The peculiar vowel treatment of Ethiopic—its fullness, its direct writing, and an identity of signs, all pointing to an Indian rather than a Shemitic relation—led Lenormant to derive the old Indian or Magadhi from a supposed primitive alphabet of Yemen. We follow an apparently conclusive German authority in referring the Indian D to the cuneatic. But the systems of this whole A family are very unlike, and there may be a supposition possible. The Libyan may represent a true Arabic alphabet, rudely formed from the hieratic syllabary, and of which the Himyari would be an enlargement under outside influence. The Hittites may have been, as often argued, a foreign race, who made a complicated and flexible syllabary out of the cuneatic as a basis, and from them the Indians may have obtained their own rich alphabet, and the forms which vary almost beyond recognition.



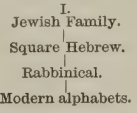
The archaic Phœnician, of 22 letters, is the parent of all the alphabets, properly so named from their first letters. It is found in connection with cuneatic in the 10th c. B.C.; descends by a regular process of greater and greater curtailment through all the colonies of that sea-faring race; mixed with Libyan it formed the script of the rivals of Rome; and, still further debased, passed over to the Turditani and the mixed race of Bastulopoeni near cape Trafalgar. It is distinguished by its abominable execution. Seldom chiseled, usually scratched, often merely smeared or painted, the letters finally become almost indecipherable, and we see for the first time the quick and careless workmanship of a race of traders and clerks. Let it be understood that all inscriptions down to the fall of Babylon are never Aramaic, or of the northern Shemitic branch; they are all of the central band—either western, Kenzani or Yehudith, or eastern, Athmith or Babli. The Hebrew branch, E, must never then be confounded with the Chaldee jargon of the later prophets, so often understood by that term; it differs, in company with Moabite, from the Phœnician, only in its being better executed and having a scriptio plenior. After the captivity the Samaritans retained the old alphabet, which passed through transition down to the present Samaritan type-letters and the late manuscript. The Hebrew letters were used on the coins of the Maccabees, and again, during the last flicker of independence, during the revolt of Bar Kokhabas. G, the Aramaic family, like all true Shemitic alphabets, is written reversed, and in modern times pointed for vowels and precessed letters.



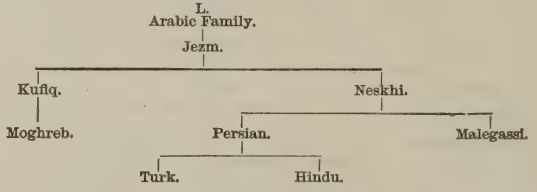
It varies from a type evidently influenced, by the local cuneatic found on the Babylonian tablets, to a coarse running style on the demotic papyri. It supplanted all the old alphabets in western Asia by the time of the last Achemenians, and results in the scheme shown in the following diagram:



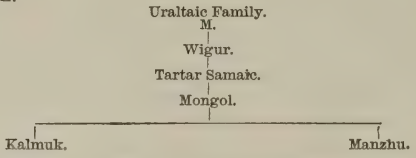
The Mandaite differentiates for vowels; but most Syrian letters are cursive, or bound by a bottom line. Final letters are the rule, and the best differentiate for place in the word. The Syrians of Malabar have a slightly changed Nestorian alphabet.



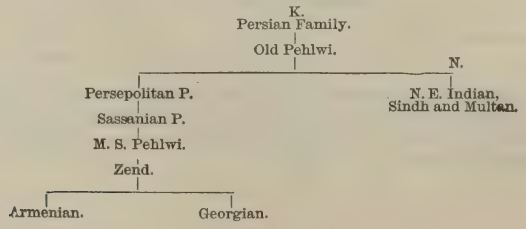
Earliest monuments known are not earlier than the 1st c. B.C. The Rabbinical is a current handwriting in use till the 12th c. A.D.; now superseded by the Spanish, the German, and the beautiful Raschi text. There are several forms of debased modern manuscript. It should be noticed that there are no Jewish manuscripts older than the 3d c. A.D., and that no vowels were pointed before the 5th century.



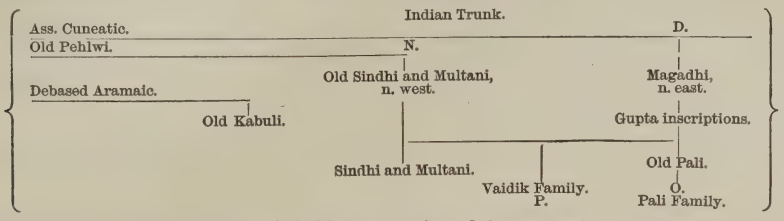
The modern Neskhi appears on the tomb at Khartoom, in Nubia, of the second generation after the prophet. The Cufic, the beautiful characters erected upon a long straight bar, and used in ornamental inscriptions, had originally only the 22 letters of the Phœnician, but they early added six precessed letters; yet not in the same order in the Barbary or Mograb alphabet. The Neskhi turned the letters into a new order, easily memorized by a mnemonic verse, but based really on their forms, those alike being brought together. It is current, with some exceptions, reversed, differentiated for four places, and pointed for vowels. The Cufic is handsomer for inscriptions, but, as illuminated with a reed pen, it may be questioned whether so graceful an alphabet has ever been invented. Like all systems of which the letters differ widely in shape, it is not, except when in too fine a type, tiresome to the eye. There are various forms of more or less cursive shape, known by different names. The Persian Tazalik reduces the short twists to one long waving stroke. All foreign nations—and Arabic is the English of the East—make needed letters by pointing those nearest in Arabic. Such alphabets are the Malay, the Turk, the Indian, and the Afghan.



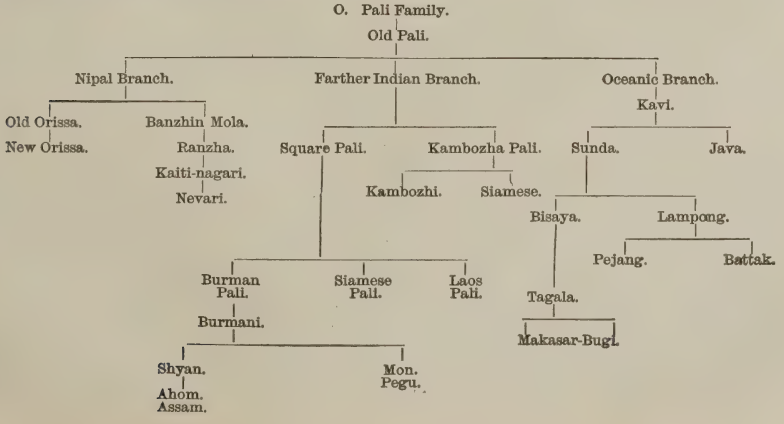
Wigur in 7th c. A.D., Manzhu in the 16th. Some differentiate for place, and connect; all write in column from above, down, which also appears to have been once true of the Estranghelo, from which they come. Kalmuk has 7 vowels and 18 consonants, the arrangement, as in all these alphabets, being arbitrary.



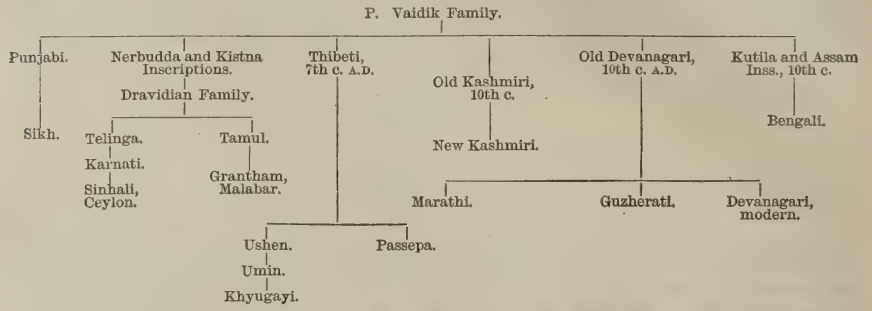
Eastern Aramaic of the Achemenian empire gradually changes, as may be traced on monuments, until it appears on the Sassanian coins. The MS. is exceedingly hard to read, the 4 vowels and 19 consonants being exceedingly alike, and ligatures and contractions numerous. The language is a conventional one, containing both Indo-German and Shemitic, and exceedingly difficult to understand: writing reversed, and words separated by a point. Zend is the language of the Avestas, and there may be distinguished an older and a newer form. An alphabet of 51 signs, which, like the last, have the flowing look of Arabic Neskhi, but many of the tails of the letters turn against the grain: writing disconnected, reversed, with ligatures. The Armenian began in the 5th c. A.D., till when they used Sassanian or Greek. They have large and small letters, both in type and cursive. The Georgian is of two types, older and newer. Both have 41 letters; and the Armenian, though undoubtedly Indo-German, appears to have been influenced to assume many strong explosives and double letters.



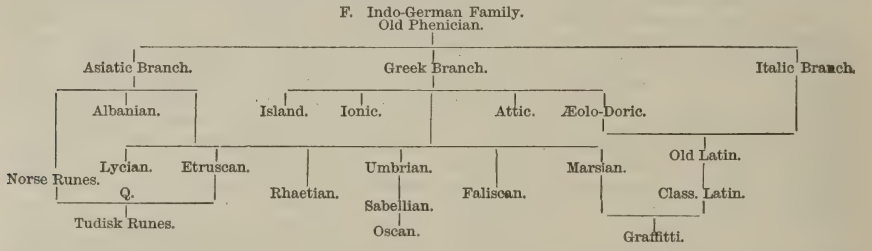
On old coins of Cabul of about 150–22 B.C. are found letters and numerals of an alphabet, evidently debased Aramaic, but more of a Syrian than of a Pehlwi type. It has neither mother nor daughter that we at present know, and has not been attached to the Aramaic branch, where it properly belongs, for that reason. The whole of Indian paleography is unsettled, and for a reason which always causes confusion; the relative antiquity of its alphabets and cultivation being closely bound up with religion, all native observations on the subject are puerile or deceptive, nor is the student fitted for researches which belong to the sphere of the archæologist. Late discoveries of inscriptions on copper, on stone, and in caves, enable us to correct many extravagant claims for Indian antiquity, yet there still remain uncertainties and illusions which only critical research can dispel. It must be remembered that northern India, Brahmani till the 5th c. B.C., became Buddhi from the 3d c. B.C. to the 6th c. A.D., the wave spreading from the town of Bihar, then Magadha. The Magadhi alphabet is without the band-line above the letters, but each consonant implies the *a* vowel, since when several follow without a vowel they go each below the other. We have inscriptions of king Açoka, 3d c. B.C.; from Guzerat, 2d c. B.C.; from Allahabad. 5th c. A.D., and several probably slightly older than any. The difference is hardly so much as might be expected in so long a time, and all the Sanskrit letters are present, at least in the latest. Pali, its descendant, easily known by its wanting the band-line, coming into use in Buddhism just before its final expulsion from hither India, naturally became finally identified with that religion, and furnished the alphabets for the languages influenced by its missionary exile. There seems to have been a n.w. center, necessarily Brahmani, which, thrown into the background by Buddhism, contributed, after the downfall of the latter, to the formation of a new character, the ancestor of the modern hither Indian alphabets, and which, as it was used in committing to writing the sacred Brahmanical books, we may call the Vaidik. Such a supposed type, a floating mixture of old n.e. and n.w. types, must have existed, for a reciprocal influence is evident between modern Devanagari and the Sindhi and Multani.



The Nipal branch is particularly interesting as showing a gradual change to a type almost identical with Devanagari. The square Pali of Burmah is probably the nearest to the old Pali of any. The Burman itself being written with a heavy, slightly rounded character, painted with a brush, and a round, semicircular type for writing with a point, which may be taken as the distinctive appearance of most of the transgangetic alphabets. The Cambogian is contorted and intricate, and the Javanese crumpled. The Buddhists arrived in Pegu at the beginning of the 5th c. A.D. There is a kind of scrawl used in Malabar which can hardly be placed, and in several instances the arrangement of Lenormant has been curtailed or altered. The best authority on Pali is the work of Burnouf and Lassen, corrected by latest essays. From Siam spreads north-east the great family of toned or musical languages, culminating in Chinese.



Buddhism made its way to Ceylon in the 3d c. B.C., and it is yet a question whether the last examples of the Dravidian family are really based on Pali or old Devanagari; they are certainly of that round type which is characteristic of the farther Indian alphabets. The modern Devanagari deserves notice from its full alphabet, from its being the exponent of a whole horde of dialects, and from its expression of the farthest developed of all the Indo-German languages. It is the only language which still connects (except certain interrupting letters) a whole sentence, and accents and inwardly changes it as one concrete expression. But the question for all scholars is, Are there any texts whatever, old in date (before the 10th c. A.D.), or, if old in date, without palpable interpolations, glosses, or subsequent precessions?



The oldest Greek inscriptions, of Melos and Thera, date from about 620 B.C. The old alphabets, besides this group of 23 letters, divide into another of 26, of two marked types—Æolian, or of Korkyra, and Doric. In many parts of Greece the Ionic, which may possibly show a derivation from secondary or Sidonian Phœnician, replaced these older types, and the Athenians, adopting the characters for *ê* and *ô* about 400 B.C., make that variety the representative alphabet of classical Greek. The Italian alphabets have all an evident primitive air, and they differ from the Greek branch in that, like the Asiatic, they do not distinguish *v* from *o*. The dates of relics are about—Faliscan, middle of 4th c. B.C., Oscan the end, Sabellian the middle, Etruscan the first half of the 5th century. That the Etruscan does not belong with the Italic family is an inference which can hardly yet be considered proved, all this subject being made more difficult by the perfectly evident borrowing of all these types, one from another, and the perplexing way in which, while striving to make up signs not in the original Shemitic, each different dialect sets a different value on the very limited stock of new signs common to all. Everything points to the presence of the Kypriot syllabary on the islands long before any alphabet through the Phœnician arrived there, but no vestiges of any such alphabet are left; and the resemblances between that syllabary and earlier alphabets are explainable exactly as were those of Phœnician and Egyptian. The Lycian alphabet, as we now have it, is very late, of the time of the satraps at the earliest; and it, like all the others, is distinctly Phœnician. It may be believed that some 13 to 16 letter alphabet once existed; the universal tradition of antiquity was to that effect; and the incomplete alphabet of early Assyrian points out what the letters and signs would naturally be;

but to find such an one we have to come down to the Norse runes, nearly 2,000 years later. The Asiatic systems are direct, but the others were at first reversed, then woven, only the survivals running direct like Greek and Latin. The late history of the two learned alphabets belongs rather to the subject of manuscript. It will be sufficient here to remind the reader that there was a cursive Greek as early as Alexandrian cultivation, and that Latin, already as much disfigured as Phenician in the scrawls (*graffiti*) on the walls of Pompeii, had also a distinct cursive as early as the 2d c. A.D. It is a mistake to speak of an Irish, Saxon, or Norse mediæval alphabet. They are simply a beautiful variety of the usual early Lombardic letters; but the influence of the Greek scribes is evident in them, and they did not merge into the far uglier, angular, black-letter.

The earliest rune futhark (like the word alpha-bet) is probably of about A.D. 300; it and all others show acquaintance with the Latin alphabet; but just as evidently, they are, on close inspection, not derived from that alone. The letters on the bracteate of Sconen are 23 (is there one lost?) in number, and correspond closely enough with the names preserved by Ulfilas in his Meso-Gothic; they are, in fact, just the same as the Markoman alphabet, and the old part of the Anglo-Saxon futhark. The old Norse futhark, on the contrary, though it does not appear until the 8th c., is much more primitive, and originally had 15 characters (staves). These were pointed to represent the needed sounds in the beginning of the 13th c. by king Waldemar, and then gave way before Christianity and its prejudice in favor of the Latin alphabet. While we see the west, or Teutonic system of runes, thus disappearing before an alphabet wholly inadequate to express the sounds of its dialects, the eastern or Slavonic took advantage of the (comparatively) brilliant ingenuity and learning of the Greek church, and, using as a basis a series of runes which unfortunately we do not possess entire, evolved the Moravian, or Cyrillic bukiviza (equals alphabet) in the 9th c., the Glagolitic, or southern Slavic, in the 13th century. The last is of, probably, 31 letters, and their forms are usually traced to a Coptic debasement of hieratic signs which equal their meaning in the original Slav. This is far-fetched. It would suffice that the Dalmatian monk Hieronymus, who invented them, had been a Copt by birth. The Cyrillic, parent of the modern Slav systems, shows the influence of the usual rounded Greek Byzantine character. It is necessary to say a few words of Russian, because it, with Devanagari and Persian Neskhi, shows a distinct attempt at a phonetic system. It is the only system that ever succeeded in spelling for Europeans the harsh and convoluted sounds of the Caucasus; it is evident what small additions would perfect the system, and the additions, generated as they might be from the original shapes of the runes, would come in well with the present letters.

On the subject of palæography the following are the latest works: Berger, *Histoire de l'Écriture dans l'Antiquité* (1891); Kirchhoff, *Geschichte des Griech. Alphabets* (1877); Faulmann, *Geschichte der Schrift* (1880); Egger, *Histoire du Livre* (1880); Blass, *Palaeographie* (1892); Gardthausen, *Griechische Palaeographie* (1879); Wattenbach, *Anleitung zur Griech. Palaeographie* (1877); id. *Anleitung zur Lat. Palaeographie* (1886); Monaci, *Facsimili di Antichi Manuscritti* (1883); and Thompson, *Greek and Latin Palæography* (1893). See also the articles Aryan Race; Cuneiform; Philology; Black Letter; Palimpsest.

PALEOL'OGUS, the name of an illustrious Byzantine family, which first appears in history about the 11th c., and attained to imperial dignity in the person of Michael VIII. in 1260. This emperor successfully undertook many expeditions to Greece and the Archipelago, and used his utmost endeavors to heal the schism between the Roman and Greek churches, though with exceedingly little success. His successor on the throne was his son Andronicus II. (1282–1329), under whose reign the Turks commenced in earnest a series of assaults on the Byzantine dominions. Andronicus attempted to oppose them with a force composed of mercenaries, but his success was very doubtful, as these troops, with perfect impartiality, attacked both his enemies and his subjects. To pay them he was compelled to levy such imposts as went far to destroy Byzantine commerce. He associated his son, Michael IX., with himself in the government, and was dethroned by his grandson, Andronicus III. (1328–41), an able warrior and wise ruler, who repeatedly defeated the Bulgarians, Tartars of the Golden Horde, and the Servians, and diminished the oppresive imposts of the previous reign. He was, however, unsuccessful against the Catalans in Greece, and the Turks during his reign ravaged Thrace as far as the Balkan. He was greatly esteemed by his subjects, and well merited the title of "father of his country," which they bestowed upon him. His son, John VI. (1355–91), a weak and voluptuous prince, attempted in vain, both by force and bribery, to stop the progress of the Turks; at last the pope, moved by his urgent entreaties, which were backed by a promise to submit the Greek church to his (the pope's) supremacy, urged the Hungarians and Servians to arm in defense of the Greek emperor, but the result was only an additional triumph to Sultan Amurath. The imbecile emperor was several times deposed, and on his final reinstatement by the sultan, acknowledged himself as his vassal for the capital and a small tract along the Propontis and Black sea. Indeed, so degraded had the Byzantines become that they obeyed the sultan Bajazet's summons to aid him in reducing Philadelphia, the last Greek stronghold in Asia Minor. His son, Andronicus IV.

(1355–73), who had been associated with him in the government, died in exile. Manuel II. (1391–1425) pursued the same tactics as his father John VI., and with the same result. The allied army of the Hungarians, Germans, and French, which he had summoned to his aid against the Turks, was totally routed at Nicopolis by Bajazet, and Constantinople itself closely beseiged. The invasion of Asia Minor by Timûr, however, compelled the sultan to withdraw his whole force, and his subsequent defeat and capture at Angora in 1402, and the contests among his sons for the supremacy, gave the Greek empire a breathing-space. Having aided Mohammed I. in his contests with his brothers, Manuel was, by the grateful sultan, presented with some districts in Greece, Thessalonica, and on the Euxine. John VII. (1425–49), on being pressed by the Turks, again held out to the pope the old bait of the union of the Greek and western churches under his sway, and even presented himself at the council of Florence, where, in July, 1439, the union of the churches was agreed to. But on his return to Constantinople, the opposition of the Greek ecclesiastics to the union, supported by the people, rendered the agreement of Florence a dead letter. The pope, however, saw that it was for his interest to fulfill his part of the agreement, and accordingly stirred up Wladislas of Hungary to attack the Turks (see JAGELLONS), but this act only hastened the downfall of the Paleologi. John's brother, Constantine XIII. (1449–53), a heroic scion of a degenerate race, accepted the crown after much hesitation, knowing his total inability to withstand the Turks, and even then took the precaution of obtaining the sultan's consent before he exercised the imperial authority; but some rebellions in Caramania which now occurred, baffling sultan Mohammed II.'s efforts to quell them, the emperor was willingly persuaded by his rash advisers that the time had now arrived for rendering himself independent of the Turks. The attempt, however, only brought swifter destruction on the wretched remnant of the Byzantine empire, for Mohammed invested the capital by sea and land, and after a siege, which lasted from April 6 to May 29, 1453, Constantinople was taken by storm, and the last of the Paleologi fell fighting bravely in the breach. A branch of this family ruled Montferrat, in Italy, from 1306, but became extinct in 1533. The Paleologi were connected by marriage with the ruling families of Hungary, Servia, and the last of the family married Ivan, czar of Russia—a fact which the czars of Russia have persisted till lately in bringing forward as a claim in favor of their pretensions to the possession of European Turkey. It is said that direct descendants of the Paleologi exist to the present day in France. (For further information see the separate articles on some of the emperors, and BYZANTINE EMPIRE.)

PALEONTOL'OGY (Gr. science of fossil animals) is that division of geology (q.v.) whose province it is to inquire into the evidence of organic life on the globe during the different bygone geological periods, whether this evidence arises from the actual remains of the different plants and animals, or from recognizable records of their existence, such as footprints, coprolites (q.v.), etc.

The metamorphic action which has so remarkably altered the oldest sedimentary rocks, is sufficient to have obliterated all traces of organic remains contained in them. Fossils are consequently extremely rare in these older paleozoic strata, and indeed it is only after long search, and within a recent time, that undoubted remains have been found in the Laurentian rocks. We were unable to record their existence in the article LAURENTIAN SYSTEM; but in the article LIMESTONE, we referred to the existence of beds of limestone as requiring the presence of animal life for their production. It is true that in 1852 an organic form resembling a coral was found in the limestone of the Ottawa, but much doubt was always entertained regarding this solitary discovery. In 1863, however, there was detected an organism in the serpentine limestone of Grenville, of true Laurentian age, which Dr. Dawson describes as that of a foraminifer, growing in large sessile patches, after the manner of *carpentaria*, but of much greater dimensions, and presenting minute points, which reveal a structure resembling that of other foraminiferal forms, as, for example, *calcarina* and *nummulina*. Large portions of the limestone appear to be made up of these organisms, mixed with other fragments, which suggest comparisons with crinoids and other calcareous fossils, but which have not yet been distinctly determined. Some of the limestones are more or less colored by carbonaceous matter, exhibiting evidences of organic structure, probably vegetable. In this single foraminifer, and the supposed coral, we have all that is positively known of the earliest inhabitants of our globe, with which we are yet acquainted. That these are but the smallest fraction of the fauna of the period in which they lived, is evident from the undetermined fragments associated with them, as well as from the extensive deposits of limestone of the same age. And that contemporaneous with them, there existed equally numerous representatives of the vegetable kingdom, cannot be doubted, when it is remembered that the animal can obtain its food only through the vegetable, and not directly from inorganic materials. Besides, their remains apparently exist in the limestone at Grenville, a rock which, from its very nature, rarely contains vegetable fossils.

The Cambrian rocks, though of immense thickness, have hitherto yielded indications of only a very few animals, but these have a special interest, as they are the oldest fossil remains yet detected in Britain. They consist of an impression which Salter considers to be portion of a trilobite, named by him *paleopyge*, of the burrows and tracks of seaworms, and of two species of radiated zoophytes called *oldhamia*—animals which in this case also can be nothing more than the most fragmentary representations of the fauna of

the period. No indications of vegetable life have yet been noticed in the Cambrian rocks, for we cannot consider the superficial markings on some of these strata as having anything to do with fuci.

Undoubted representations of the four invertebrate sub-kingdoms early make their appearance in the Silurian strata, and the occurrence before the close of the period of several fish, adds to them the remaining sub-kingdom—the vertebrata. If we except the silicious frustules of diatomaceæ which are said to have been detected in these rocks, no satisfactory traces of plants have yet been observed, although extensive layers of anthracitic shales are common. Of the lower forms of the animal kingdom, some sponge-like bodies have been found, and corals are remarkably abundant, chiefly belonging to the order *rugosa*, a paleozoic type, the members of which have horizontal tabulæ, and vertical plates or septa, either four in number, or a multiple of four. Graptolites, another family of zoophytes, flourished in the dark mud of the Silurian seas, and did not survive the period. All the great divisions of the mollusca are represented by numerous genera, several of which are not very different from some living forms. A few true star-fishes have left their records on the rocks, but the most striking feature in the echinodermata of the period is the cystideans, or armless sea-lilies, which, like the Graptolites, did not pass beyond the Silurian seas. Tubes, tracks, and burrows of annelids have been observed; and numerous crustacea, belonging, with the exception of one or two shrimp-like species, to the characteristic paleozoic trilobite, of which the number of individuals is as remarkable as the variety of species and genera. It is only in the upper portion of the group (the Ludlow beds) that the fish remains have been found. These have been referred to six different genera, and are chiefly loricate ganoids, of which *cephalaspis* is the best known.

The rocks of the old red sandstone period supply the earliest satisfactory remains of plants. The ferns, sigillariæ, lycopodites, and calamites, so abundant in the coal measures, make their appearance among the newer of these beds, and even fragments of dicotyledonous wood have been observed. The various sections of the invertebrata are well represented, but the remarkable characteristic in the animal life of the period is the abundance of strange forms of heterocercal-tailed fish, whose buckler-shields, hard scales, or bony spines occur in the greatest abundance in some beds. The reptiles and reptile tracks in the red sandstone of Moray, originally referred here, are now universally considered as belonging to the new red measures.

The striking feature in the rocks of the carboniferous period is the great abundance of plants, the remains of which occur throughout the whole series, the coal-beds being composed entirely of them, the shales being largely charged with them, the sandstones containing a few, and even the limestones not being entirely without them. These plants were specially fitted for preservation, the bulk of them being vascular cryptogams, a class which Lindley and Hutton have shown by experiment to be capable of long preservation under water. They are chiefly ferns; some are supposed to have been arborescent lycopods, while others (*sigillaria*, *calamites*, and *asterophyllites*) are so different from anything now known, that their position cannot be definitely determined, though it is most probably among the higher cryptogams. Several genera of conifers have been established from fossilized fragments of wood; and some singular impressions, which look like the flowering stems of dicotyledonous plants, have been found. The limestones are chiefly composed of crinoids, corals, and brachiopodous shells. The corals attain a great size, and the crinoids are extremely abundant, their remains making sometimes beds of limestone 1000 ft. thick, and hundreds of square miles in extent. Many new genera of shells make their appearance. The trilobites, which were so abundant in the earlier rocks, are reduced to one or two genera, and finally disappear with this period. Fish with polished bony scales are found; and others, like the Port Jackson shark, with pavements of flat teeth over their mouth and gullet, fitting them to crush and grind the shell-protected animals on which they fed. Strange fish-like reptiles existed in the seas, and air-breathing species have been found on the continent and in America. The wing-cases, and parts of the bodies of insects, have also been found.

The permian period is remarkable for the paucity of its organic remains, but this may arise from our comparative ignorance of its strata. The plants and animals are on the whole similar to those found in the carboniferous measures, and a great proportion of them belong to the same genera. Many ancient forms do not pass this period, as the *sigillaria* among plants, and the *producta* among animals.

The red sandstones of the triassic period are remarkably destitute of organic remains —the iron, which has given to them this color, seems to have been fatal to animal life. In beds, however, on the continent, in which the iron is absent, fossils abound. These fossils present a singular contrast to those met with in the older rocks. The paleozoic forms had been gradually dying out, and the few that were still found in the permian strata do not survive that period, while in their place there appear in the trias many genera which approach more nearly to the living forms. Between the organisms of the permian and triassic periods there exists a more striking difference than is to be found between those of any previous periods. Looking at this life-character, the rocks from the permian downwards have been grouped together under the title paleozoic; while from the trias upwards the whole of the strata have received the name of neozoic.

The extensive genera of ammonites and belemnites make their first appearance in the trias. Several new forms of cestraciont fish occur, and the reptiles increase in number and variety; among them is the huge batrachian labyrinthodon, and the singular fresh-water tortoise, dicynodon. The bird-tracks on the sandstones of Connecticut are by some referred to this age. Small teeth of mammalia, believed to be those of an insectivorous animal, like the myrmecobius of Australia, have been found in the keuper beds of Germany and Somerset.

In the oolitic series we have an abundance of organic remains, in striking contrast to the scanty traces in the permian and triassic periods. Many new genera of ferns take the place of the paleozoic forms, and a considerable variety of conifers make their appearance, some of which have close affinities with living species, one, indeed, being referred to a still existing genus. The same approximation to living types is to be found in the animal kingdom. Several of the foraminifers are referred to living genera. Among the corals, the representatives of two living families make their appearance. No new genera are found among the brachiopoda; but the conchifera and gasteropoda show a great addition of new genera, some of which are still represented by living species, while not many new genera were added to the cephalopoda, though they were individually very abundant. In some places the lias shale consists of extensive pavements of belemnites and ammonites. The crinoids give place to the increasing variety of sea-urchins and star-fishes. Numbers of insects have been found. The cestracionts continue to be represented in the oolitic seas, but with them are associated several true sharks and rays; and the homocercal-tailed fish become numerous. Labyrinthodont reptiles abound: the huge megalosaur and its companions occupied the land; while the seas were tenanted with the remarkable ichthyosaur and plesiosaur, and the air with the immense bat-like pterodactyl. Seven genera of mammalia have been found, all believed to be small carnivorous or insectivorous marsupials except the stereognathus, which Owen considers to have been a placental mammal, probably hoofed and herbivorous.

In the cretaceous beds, which are chiefly deep sea deposits, the remains of plants and land animals are comparatively rare. The wealden beds, however, which had a fresh-water origin, contain the remains of several small marsupials, some huge carnivorous and herbivorous reptiles, a few fresh-water shells, and some fragments of drift-wood. The true chalk is remarkably abundant in the remains of foraminifers—indeed, in some places, it is composed almost entirely of the shells of these minute creatures. Of the mollusca, the brachiopoda are in some beds very abundant; the conchifera introduce several new forms, the most striking of which is the genus hippurites, which with its allies did not survive this period; the cephalopodous genera which appeared in the oolite continue to abound in the chalk, many new forms being introduced; while others disappear with the period, like the belemnites and ammonites. Sea-urchins become still more numerous. In some beds the remains of fish are abundant, and while cartilaginous species still exist, the bony fishes become more numerous; and among them the family to which the salmon and cod belong makes its appearance. Reptiles are common in the wealden, and the flying pterodactyls attained a greater size, and were probably more numerous than in the former period. The remains of a single bird has been obtained from the greensand, but with this exception, birds as well as mammals have left no traces that have yet been found in the cretaceous beds, though doubtless they existed.

In the tertiary strata, the genera are either those still living, or forms very closely allied to them, which can be separated only by the careful examination of the accurate scientific observer. The plants of the eocene beds are represented by dicotyledonous leaves, and palm and other fruits. Foraminifers are remarkably abundant, whole mountain masses being formed of the large genus nummulites. Brachiopoda are rare, but conchifera, gasteropoda, and cephalopoda increase in number; the new forms being generically almost identical with those now living. The principal living orders of fish, reptiles, and birds are represented in the eocene strata. A considerable variety of pachydermatous mammals, suited apparently to live on marshy grounds and the borders of lakes, have been found in France and England, and associated with them are some carnivorous animals, whose remains are, however, much rarer. An opossum has been found at Colchester. The fragments belonging to the supposed monkey are portions of a small pachyderm, *hyracotherium* (q.v.).

Little need be said of the invertebrata of the miocene period, beyond remarking their growing identity in genera with the living forms. Among the mammals, the quadrumana make their first appearance. The true elephant and the allied mastodon are represented by several species; a huge carnivorous whale has been discovered, and several carnivora and deer, with a huge edentate animal, have been described. Owen thus speaks of these animals: "Our knowledge of the progression of mammalian life during the miocene period, teaches us that one or two of the generic forms most frequent in the older tertiary strata still lingered on the earth, but that the rest of the eocene mammalia had been superseded by new forms, some of which present characters intermediate between those of eocene and those of pliocene genera."

In passing upwards through the tertiary strata, the organic remains become more and more identical with living forms, so that when we reach the pliocene and pleistocene periods, the great proportion of the invertebrata are the same species which are found occupying the present seas. Among the higher orders of animals the life of a species is

much shorter than in the lower, and consequently, though the vertebrata approach so nearly to existing forms as for the most part to be placed in the same genera, yet the species differ from any of the living representatives of the different genera.

The Suffolk "crags," which are the only British representatives of the pliocene period, contain the relics of a marine testacea, that differs little from the present tenants of the European seas, between 60 and 70 per cent being the same species. The ear-bones of one or more species of cetacea have been found, and at Antwerp, the remains of a dolphin have been discovered in beds of this age.

The various local deposits which together form the pleistocene strata, the latest of the geological periods, contain a great variety of organic remains. In the submarine forests and in beds of peat, the stumps of trees are associated with the remains of underwood and herbaceous plants of species still living. Nearly all the mollusca and other marine invertebrata still survive. It is among the vertebrata that the most remarkable forms appear—forms which in the main differ little from the existing race of animals except in their enormous size. Elephants and rhinoceroses, fitted for a cold climate by their covering of long coarse hair and wool, roamed over the northern regions of both the old and the new world, and were associated with animals belonging to genera which still exist in the same region, as bears, deer, wolves, foxes, badgers, otters, wolverines, weasels, and beavers, besides others whose representatives are now found further south, as the hippopotamus, tapir, and hyena. Contemporary with these, there lived in South America a group of animals which were types in everything but in size of the peculiar existing fauna of that continent. Among these were gigantic sloth-like animals, fitted to root up and push down the trees, instead of climbing to strip them of their foliage, like the sloth. The armadillo was represented by the huge glyptodon, whose body was protected by a strong tessellated coat of mail. The species of fossil tapirs and peccaries are more numerous than their living representatives. The llamas were preceded by the large macrauchenia, and the opossums and platyrhine monkeys were also prefigured by related species. Besides these, there have been found the remains of two mastodons and a horse, none of which are represented by any indigenous living animal in South America. The peculiar group of animals confined to Australia were prefigured by huge marsupials, some having close analogies to the living kangaroos and wombats, while others were related to the carnivorous native tiger. The gigantic wingless birds of New Zealand correspond in type with the anomalous apteryx, now existing only on these islands.

Associated with the remains of elephants, mastodons, cave-bears, and cave-hyenas, there have been found in England and France, numerous specimens of flint implements, which are undoubtedly the result of human workmanship, and show at least that man was contemporaneous with these extinct animals. If more certain evidence were needed of this, it has been obtained in the discovery of flint implements, bone implements fashioned and carved by means of the flint knives, the horns of a reindeer, two kinds of extinct deer, bos primigenius, and other animals, associated with numerous bones of man, included in the breccia of the cave of Bruniquel in France. Owen considers the evidence of the contemporaneity of the various remains as conclusive. The several human skulls which have been obtained show, acccording to the same authority, no characters whatever indicative of an inferior or transitional type. There are no certain data to give probability to the guesses which have been made as to the number of years which have elapsed since these deposits in which the relics of man occur were formed. See illus., Silurian Fossils, vol. XIII.; Oolite Group, vol. X.; Tertiary Period, vol. XIV.; Muschelkalk Period, vol. X.

PALEONISCUS (Gr. ancient sea-fish), a genus of ganoid fish, with a fusiform body, covered with rhomboid scales, a heterocercal tail, and moderately-sized fins, each furnished with an anterior spine. The single dorsal fin is opposite to the interval between the anal and ventral fins. Twenty-eight species have been described from the carboniferous and permian measures.

PALEOPYGE (Gr. ancient rump), a genus of fossil crustacea, founded on a single impression from the surface of a bed in the Longmynd, of Cambrian age. Salter believes it to be the cephalic shield of a trilobite, but it may be only an accidental marking. If it be the impression of an organism, it is so distorted and imperfect that little can be made of it; its peculiar interest arises from its being associated with the earliest forms of life that have been observed on the globe.

PALEOSAURUS (Gr. ancient lizard), a genus of fossil saurian reptiles peculiar to the permian period. The remains of two species occur in the dolomitic conglomerate in England, near Bristol. The teeth were more or less compressed, and were furnished with serrated cutting margins. The vertebræ were biconcave, and had a remarkable depression in the center of each vertebra, into which the spinal canal was sunk. The leg-bones show that the paleosaurs were fitted for moving on the land. Owen thus exhibits their affinities: "In their thecodont type of dentition, biconcave vertebræ, double-jointed ribs, and proportionate size of the bones of the extremities, they are allied to the teleosaurus, but with these they combine a dinosaurian femur, a lacertian form of tooth, and a crocodilian structure of pectoral and probably pelvic arch."

PALEOTHE'RIUM (Gr. ancient wild beast), a genus of pachydermatous mammalia whose remains occur in the eocene beds of England and the continent. At least ten species have been described, ranging in size from that of a sheep to that of a horse. The upper eocene gypseous quarries of Montmartre supplied the first scanty materials, which Cuvier, by a series of careful and instructive inductions, built up into an animal, whose fidelity to nature was afterwards verified by the discovery of a complete series of fossils. In general appearance the paleotherium resembled the modern tapir, and especially in having the snout terminating in a short proboscis. It had three toes on each foot, each terminated by a hoof.—The formula of the teeth is the same as that of the hyracothere, viz.,

$$i.\frac{3—3}{3—3},\ c.\frac{1—1}{1—1},\ p.\ m.\frac{4—4}{4—4},\ m.\frac{3—3}{3—3}=44;$$

but the structure of the molars approaches nearer to the molars of the rhinoceros. It is supposed that animals of this genus dwelt on the margins of lakes and rivers, and that their habits were similar to those of the tapir.

PALEOZO'IC (Gr. ancient life), the name given to the lowest division of the fossiliferous rocks, because they contain the earliest forms of life. They were formerly, and are still generally, known as the primary rocks. The strata included under these titles are the laurentian, cambrian, silurian, old red sandstone, carboniferous, and permian systems. Phillips, for the sake of uniformity, introduced mesozoic as equivalent to secondary, and neozoic to tertiary rocks.

PALER'MO, an archiepiscopal city and an important seaport of the island of Sicily; and along with Naples, Rome, Milan, and Turin, one of the five most populous cities in the kingdom of Italy, is situated on the n. coast of the island, near the n.w. corner of the bay of Palermo, 120 m. by water w. of Messina; lat. 38° 6′ n., long. 13° 20′ e. It stands in a highly-cultivated and fertile plain called *La Conca d'Oro* (The Golden Shell), commands a beautiful view of the gulf of Palermo, on which it stands, and is backed toward the interior by ridges of mountains. In shape the town is an oblong parallelogram, the direction of its length being from s.w. to n.e. It is divided into four quadrangular parts by two great streets, the beautiful Via Vittorio Emanuele, formerly the *Via Toledo* or *Cassaro*, and the *Strada Nuova* or *Macqueda*, which cross each other at right angles in the middle of the city. It is upward of four m. in circumference, is surrounded by walls pierced with 12 gates and flanked with bastions, and is defended by several batteries. The houses are balconied, flat-roofed, and have glass doors instead of windows. The streets, besides the two main thoroughfares already mentioned, are generally well laid out, and there are several fine promenades, of which the famous Marina, extending along the shore, on the line of the ancient fortifications, and bordered by the palaces of the nobles, is the most magnificent. Palermo contains many parish churches; abbeys; monasteries and convents, to which belong from 20,000 to 30,000 monks and nuns; and, besides these, a number of oratories. Among the churches is counted the cathedral—the church of St. Rosalia. At the intersection of the two principal streets there is a large octagonal space or *piazza*, lined with palaces, and adorned with statues and marble fountains. The royal palace is a huge pile of buildings, with a splendid chapel, built in 1129, and contains many pillars of rare workmanship and rich mosaics with Arabic inscriptions. The cathedral is a fine edifice, originally Gothic, but to which incongruous Greek additions have been made, is adorned with marble columns and statues, and contains monuments of the emperor Frederick II. and of king Roger, the founder of the Norman monarchy in Sicily. Among the principal public institutions of Palermo are the university, an academy of arts and sciences, a medical academy, an institution for arts and antiquities, a beautiful and extensive public garden, public libraries, theaters, etc. Palermo is an archbishop's see, the residence of the governor of the island, and the seat of the supreme courts. Manufactures of silks, cottons, oil-cloth, leather, gloves, etc., are carried on. The harbor is formed by a mole, 1300 ft. in length, on which there is a light-house and battery. Vessels of 700,000 tons enter and clear the port annually, and the imports amount in value to near £1,000,000, and the exports to about the same sum. Pop. '71 of Palermo with suburbs, 186,406; of commune, 219,838. Pop. '81, 205,712; '94, 280,500.

The environs of Palermo are interesting as well as picturesque, and embrace many pleasant villas and noble mansions. North-west of the city is Monte Pellegrino, the Eircte of the ancients, an abrupt rocky mass, in which there is a grotto or cave, in which Santa Rosalia, a young Norman princess, lived a life of religious retirement. In Palermo, Santa Rosalia is esteemed more highly than even Santa Maria; the festival in her honor lasts from the 9th to the 13th of July, and is the most important festival held on the island. During its celebration the city is illuminated, the streets are gay and brilliant, and there is an immense influx of strangers from the vicinity. But the chief feature of the festival is the procession to the cave. An immense silver image of the saint is borne thither on a wagon, 70 ft. long, 30 ft. broad, and 80 ft. high. Its form resembles that of a Roman galley, with seats for a choir. The wagon is drawn by 56 mules, covered with the gayest trappings, and driven by 28 postilions.

Palermo, the ancient *Panormus*, was originally a Phenician colony, but had become

a dependency of Carthage before the name occurs in history. With the exception of a short time about 276 B.C., when it fell into the hands of the Greeks, it continued to be the headquarters of the Carthaginian power in Sicily, until it was taken by the Romans during the first Punic war (254 B.C.), when it became one of the principal naval stations of the Romans. The name Panormus is derived from the excellent anchorage (Gr. *hormos*) in the bay; but the Phenician name found on coins is *Machanath*, meaning "a camp." The Vandals, and afterwards the Arabs, made it the capital of the island, and after the Norman conquest it continued to be the seat of the king of Sicily. It still remained the royal residence under the Aragonese kings; but the court was removed after Sicily became united to the then kingdom of Naples. See SICILY. See illus., ITALIAN ARCHITECTURE, vol. VIII.

PA'LES, in Roman mythology the goddess who presided over flocks and shepherds, and was worshiped with great pomp. Her festival, called *Palilia*, was celebrated April 21, the anniversary, according to tradition, of the founding of Rome by Romulus. On this day the shepherds purified their flocks by making them pass round a large fire made of laurel, pine, and olive branches, sprinkled with sulphur. Milk, wine, and millet, were then placed on the altar of the goddess, who was entreated to bless the earth and the cattle with fecundity, and avert injury from both.

PALESTINE (*Palæstina*, *Philistia*), or the HOLY LAND, a country of south-western Asia, comprising the southern portion of Syria, and bounded on the w. by the Mediterranean, e. by the valley of the Jordan, n. by the mountain-ranges of the Lebanon and the glen of the Litâny (Leontes), and s. by the desert of Sinai; lat. 31° 15′ to 33° 20′ n., long. 34° 30′ to 35° 30′ east. Within these narrow limits, not more than 145 m. in length by 45 in average breadth—an area less than that of the principality of Wales—is comprised the "Land of Israel" or "Canaan," the arena of the greatest events in the world's history. The principal physical features of Palestine are, (1) a central plateau or table-land, with a mean height of 1600 ft., covered with an agglomeration of hills, which extend from the roots of the Lebanon to the southern extremity of the country; (2) the Jordan valley and its lakes; and (3) the maritime plain, and the plains of Esdraëlon and Jericho. On the e., the descent from the central plateau is steep and rugged, from lake Huleh to the Dead sea. On the w. it is more gentle, but still well marked, towards the plains of Philistia and Sharon. The ascertained altitudes on this plateau, proceeding from s. to n., are Hebron, 3,029; Jerusalem, 2,500; mount of Olives, 2,724; mount Gerizim, 2,849; mount Tabor, 1,843; Safed, 2,775 ft. above the sea. Nearly on the parallel of the sea of Galilee, the range of Carmel extends from the central plateau n.w. to the Mediterranean, where it terminates abruptly in a promontory surmounted by a convent. It rises from 600 ft. in the w., to 1600 ft. in the e., and is composed of a soft white limestone, with many caverns. Beyond the boundary of Palestine on the n., but visible from the greater part of the country, mount Hermon rises to 9,050 ft., and is always snow-clad. From the formation of the central plateau, the drainage is nearly always e. and w., to the Jordan and the Mediterranean. The streams of the plateau are insignificant, and generally dry in summer.

The geological formation of the country consists of jurassic and cretaceous limestone, often covered with chalk, and rich in flints, with occasional interruptions of tertiary, basaltic, and trappean deposits. The upper strata consist of limestone of a white or pale-brown color, containing few fossils, but abounding in caverns, which form one of the peculiarities of the country. The general features of the landscape exhibit soft rounded hills, separated by narrow glens or valleys of denudation; the strata are occasionally level, but more frequently violently contorted, as seen on the route from Jerusalem to Jericho, where the fissures are often 1000 ft. deep, and only 30 or 40 ft. wide. Ironstone occurs in small quantities; rock-salt, asphaltum, and sulphur abound near the Dead sea, where, as also near the sea of Galilee, there are many hot springs. Volcanic agency is evident in the obtruded lava of former ages, and in frequent earthquakes of modern times. The vast crevasse through which the Jordan flows, and which cleaves the land from n. to s., is one of the most remarkable fissures on the surface of the globe; it is from 5 to 12 m. wide, and of the extraordinary depth of 2,630 ft. at the bottom of the Dead sea. Through this the river descends at the rate of 11 ft. in a mile, with a course so tortuous that it travels 132 m. in a direct distance of 64, between the sea of Galilee and the Dead sea. It is the only perennial river of Palestine, except the Kishon, which is permanent only in its lower course, and the Litâny on its northern border. See JORDAN. The only lakes of Palestine are in the valley of the Jordan. See GENNESARET, SEA OF, and DEAD SEA.

The plain of Philistia extends from the coast to the first rising ground of Judah, about 15 m. in average width; the soil is a rich brown loam, almost without a stone. It is in many parts perfectly level; in others undulating, with mounds or hillocks. The towns of Gaza and Ashdod, near the sea, are surrounded by groves of olives, sycamores, and palms. This plain is still, as it always was, a vast corn-field, an ocean of wheat, without a break or fence; its marvelous fertility has produced the same succession of crops, year after year, for forty centuries without artificial aid. The plain of Sharon is about 10 m. wide in the s., narrowing towards the n., till it is terminated by the buttress of Carmel. Its undulating surface is crossed by several streams; the soil is rich,

and capable of producing enormous crops; but only a small portion of it near Jaffa is cultivated, and it is rapidly being encroached on by the sea sand, which, between Jaffa and Cæsarea, extends to a width of 3 m. and a height of 300 feet. The famous ancient cities of this region, Cæsarea, Diospolis, and Antipatris, have vanished. Jaffa (Joppa) alone remains, supported by travelers and pilgrims from the w. on the way to Jerusalem. The great plain of Esdraëlon, or Jezreel, extends across the center of the country, from the Mediterranean to the Jordan, separating the mountain-ranges of Carmel and Samaria from those of Galilee. Its surface is drained by the Kishon, which flows w. to the Mediterranean at Haifa. The plain is surrounded by the hills of Gilboa and Little Hermon; the isolated Mount Tabor rises on its n.e. side. It is extremely fertile in grain where cultivated, and covered with gigantic thistles where neglected. It is richest in the central part, which slopes e. to the Jordan—the battle-field where Gideon triumphed, and Saul and Jonathan were overthrown. It is the home of wandering Bedouins, who camp in its fields, and gallop over its green-sward in search of plunder. Many places of deep historical interest are connected with this plain. Shunem, Nain, Endor, Jezreel, Gilboa, Bethshan, Nazareth, and Tabor are all in its vicinity. The plain of Jericho is a vast level expanse, covered with the richest soil, now quite neglected. Around the site of Jericho, "the city of palm-trees," there is not now a single palm; but a recent experiment proved its capability of producing in abundance all the crops for which it was formerly famous. The climate of Palestine is very varied; January is the coldest and July the hottest month. The mean annual temperature of the year at Jerusalem is 65° Fahr., resembling that of Madeira, the Bermudas, and California. The extreme heat of the summer months is modified by sea-breezes from the n.w. In the plain of Jericho and the Jordan valley it is extremely hot and relaxing. The *sirocco*, a s.e. wind, is often oppressive in early summer. Snow falls in the uplands in January and February, and thin ice is often found at Jerusalem, where the annual rainfall is 61 inches. Heavy dews fall in summer, and the nights are cold. Violent thunder-storms occur in winter. In the s., Judah and part of Benjamin, is a dry, parched land; the bare limestone rock is covered here and there with a scanty soil, and the vast remains of terraces show how assiduously it must have been cultivated in ancient times to support the teeming population indicated by the ruins of cities with which every eminence is crowned. To the n. of Judea the country is more open, the plains are wider, the soil richer, and the produce more varied, till at Nablous the running streams and exuberant vegetation recall to the traveler the scenery of the Tyrol. Even in its desolation, Palestine is a land flowing with milk and honey. There is no evidence of its climate having changed or deteriorated, nor any reason to suppose that it would fail to support as great a population as ever it did, provided the same means as formerly were used for its cultivation. It has the same bright sun and unclouded sky, as well as the early and latter rain, which, however, is diminished in quantity, owing to the destruction of trees.

The botany of Palestine is rich and varied, resembling that of Asia Minor. Among its trees are the pine, oak, elder, and hawthorn in the northern and higher districts, and the olive, fig, carob, and sycamore elsewhere. The cultivated fruits are the vine, apple, pear, apricot, quince, plum, orange, lime, banana, almond, and prickly pear. Wheat, barley, peas, potatoes, and European vegetables, cotton, millet, rice, maize, and sugar-cane are among its products. The date now ripens its fruit only in the s. and on the sea-board. The brilliant flowers which in spring enamel the surface and tinge the entire landscape, comprise the adonis, ranunculus, mallow, poppy, pink, anemone, and geranium. In the Jordan valley, 900 or 1000 ft. below the sea-level, the vegetation is tropical in its character, resembling that of Arabia; the nubk (*spina christi*), the oleander, and the small yellow "apples of Sodom" are conspicuous. The most valuable products of the vegetable kingdom are derived from the vine, fig, olive, and mulberry trees. Wine for home use is made in all the central and southern districts; the best is made at Hebron from the grapes of Eshcol. Olive-oil is a valuable export.

The wild animals of Palestine comprise the Syrian bear in Lebanon, the panther, jackal, fox, hyena, wolf, wild boar, gazelle, and fallow-deer; the lion is now unknown. The domestic animals are the Arabian camel, ass, mule, horse, buffalo, ox, and broad-tailed sheep. Among the birds are the eagle, vulture, kite, owl, nightingale, jay, and kingfisher—the latter of brilliant plumage—the cuckoo, heron, stork, crow, partridge, and sparrow. Fish swarm in the sea of Galilee, and bats and lizards abound.

The divisions of Palestine in Old Testament times were into 9½ tribes in the w., and 2½ tribes in the e. of the Jordan. In New Testament times, on the w. of the Jordan, the provinces of Galilee in the n., Samaria in the middle, and Judea in the s.; on the e. of the Jordan, Perea and Decapolis. The boundaries of the tribes and provinces are very uncertain. Its modern divisions have changed with every new race and dynasty of conquerors. Under Turkish rule, Palestine is comprised in the vilayet of Syria, and contains the two subpashalics of Acre and Jerusalem. The present population is near 700,000, and consists mainly of a race of mixed descent, sprung from Syrians, Arabs, and Greeks. The Jews are all foreigners, almost exclusively inhabiting the four holy cities—Jerusalem, Hebron, Tiberius, and Safed; their whole number was, in 1871, estimated at only 10,000. The country is oppressed by Turkish avarice, and overrun by the predatory Arabs. The Palestine exploration has done good work in the identification of Biblical and classical sites, etc. See G. A. Smith, *The Historical Geography of the Holy Land* (1894). See SYRIA.

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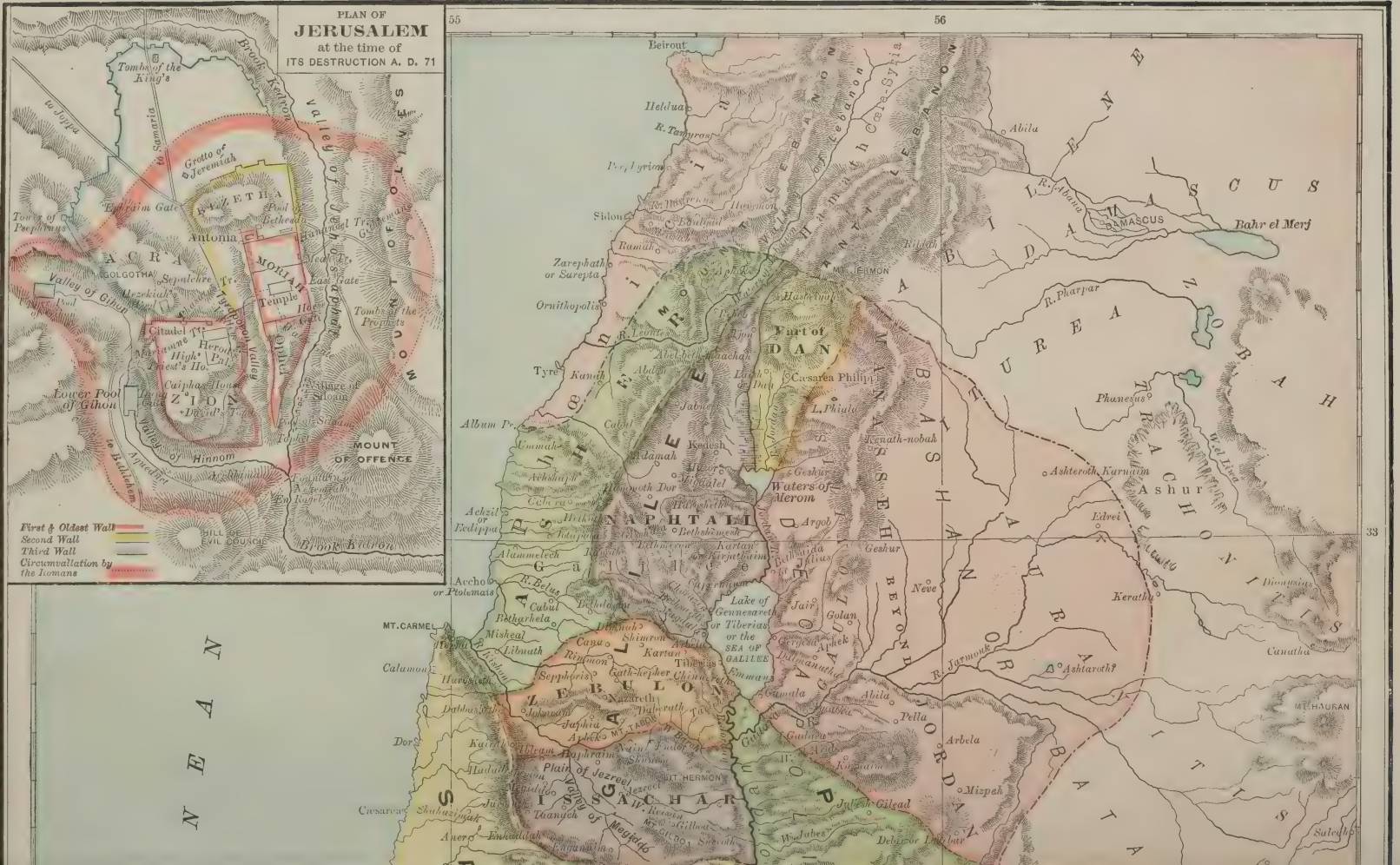
PLAN OF
JERUSALEM
at the time of
ITS DESTRUCTION A. D. 71
Tomb of the King's
Brook Kedron
Valley of Jehoshaphat
to Samaria
to Joppa
Grotto of Jeremiah
Ephraim Gate
BEZETHA
Pool
Bethesda
Tower of Psephinus
Antonia
Hezekiah's Tunnel
Tyropoeon Valley
Upper City
Herod's Gate
Tombs of the Prophets
Valley of Gihon
GOLGOTHA
Sepulchre
Hezekiah's Pool
MORIAH
East Gate
Temple
Citadel
Herod's Palace
High Priest's House
Caiphas' House
Lower Pool of Gihon
ZION
David's Tomb
Gate
Bridge
Xystus
Palace of Solomon
MOUNT OF OFFENCE
Valley of Hinnom
to Bethlehem
Aqueduct
Jeremiah's Grotto
En Rogel
Hill of Evil Counsel
Brook Kedron
First & Oldest Wall
Second Wall
Third Wall
Circumvallation by the Romans
55
56
33
Beirout
Heldua
R. Tamyras
Sidon
Ramah
Zarephath or Sarepta
Ornithopolis
Tyre
Kanah
Album Pr.
Achzib or Ecdippa
Accho or Ptolemais
MT. CARMEL
Calamon
Dor
Caesarea
Anero
Encaddah
Taanach
Megiddo
Valley of Megiddo
Shunem
Jezreel
Plain of Jezreel
MT. HERMON
Ashteroth Karnaim
Edrei
Kerathi
Canatha
Ashtaroth
Mizpah
Jabesh Gilead
Debir or Lidebar
Succoth
Abila
R. Abana
DAMASCUS
Bahr el Merj
R. Pharpar
Phanesus
Waters of Merom
Kenath-nobah
Caesarea Philippi
L. Phiala
Part of DAN
Ashur
Bashan
Argob
Golan
Jair
Geshur
Neve
Pella
Arbela
Gadara
Gerasa
Ajlun
Lake of Gennesareth or Tiberias or the SEA OF GALILEE
Jordan
Valley of Jordan
Beyond Jordan
Mt. Hauran
Batanea
Trachonitis
Auranitis
Gaulonitis
Peraea
Galilee
Naphtali
Zebulon
Issachar
Asher
Napthali
Bethsaida Julias
Kartan or Kirjathaim
Kedesh
Hazor
Abilene
Lebanon
Mt. Lebanon
Anti-Lebanon
Mt. Hermon
Libnah
Rimmon
Cana
Shimron
Kartan
Tabor
Japhia
Nazareth
Dabareth
Bethsaida
Capernaum
Chinnereth
Emmaus
Gath-hepher
Sepphoris
Bethulia
Jotapata
Gischala
Jamnith
Ramoth Gilead
Gamala
Hippos
Gadara
Abila
Pella
Arbela
Mizpah
Jabesh Gilead
Succoth
Salecah
Debir or Lidebar
Jubes
Waters of Merom
Kenath-nobah
Caesarea Philippi
L. Phiala
Part of DAN
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Mt. Hermon
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Cana
Shimron
Kartan
Tabor
Japhia
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Dabareth
Bethsaida
Capernaum
Chinnereth
Emmaus
Gath-hepher
Sepphoris
Bethulia
Jotapata
Gischala
Jamnith
Ramoth Gilead
Gamala
Hippos
Gadara
Abila
Pella
Arbela
Mizpah
Jabesh Gilead
Succoth
Salecah
Debir or Lidebar
Jubes
NEAN
SEA
LEBANON
ANTI-LEBANON
MT. HERMON
BASHAN
AURANITIS
TRACHONITIS
GAULONITIS
PERAEA
GALILEE
NAPHTALI
ZEBULON
ISSACHAR
ASHER
DAN
JORDAN
VALLEY OF JORDAN
BEYOND JORDAN
MT. HAURAN
BATANEA

PALESTINE
SCALE OF MILES
0 5 10 20 30
Longitude East from Greenwich
MEDITERRANEAN SEA
SALT OR DEAD SEA or Sea of the Plain
MANASSEH
EPHRAIM
SAMARIA
BENJAMIN
JERUSALEM
JUDAH
DAN
SIMEON
REUBEN
GAD
MOAB
AMMON
PHILISTIA
Desert of Shur
Wilderness of Beer-sheba
Desert of Paran
Desert of Zin
Pilgrims Road to Mecca
MT. NEBO OR PISGAH
MOUNT GILEAD
Ramoth Gilead
MT. OF OLIVES
MT. GERIZIM
MT. EBAL
Jacob's Well
Jericho
Bethlehem
Hebron
Gaza
Ascalon
Ashdod or Azotus
Joppa
Lydda
Beer-sheba
Wilderness of Ziph
Wilderness of Maon
Hill Country
South Country
Valley of Salt
Ascent of Akrabbim
Kadesh Barnea
Bozrah
Tophel
Ziklag
Elusa
Mashita
Medeba
Heshbon
Dibon
Kir-moab
Rabbath Ammon
Brook Besor
Brook Sorek
River Jordan
Baths of Callirhoe
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56

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PALESTINE, city in Anderson co., Texas, 95 m. s.e. of Texas. It has manufactures of cotton and leather goods, saw mills, etc. Pop. '90, 5838.

PALES'TRA, a building for gymnastic sports.

PALESTRI'NA (the ancient *Præneste*), an episcopal city of the present kingdom of Italy, in the province and 10 m. s.e. by s. of Tivoli, occupies a strong position on the s.w. slope of a high hill, an offset of the Apennines. Besides several interesting churches, the town contains a castle, once the chief stronghold of the Colonna, to whom the town belonged; and the palace and garden of the Barberini family. Pop. 6100.

Palestrina is built almost entirely upon the site and the gigantic substructions of the Temple of Fortune, one of the great edifices of the former city of Præneste. This city was one of the most ancient as well as powerful and important cities of Latium. It covered the hill (2,400 ft. above sea-level) on the slope of which the modern town stands, and was overlooked by a citadel of great strength. The site of this citadel on the summit of the hill is now occupied by a castle of the middle ages, called *Castel S. Pietro;* but remains of the ancient walls are still visible. We first hear of Præneste as a member of the Latin League; but in 499 B.C. it quitted the confederacy, and joined the cause of the Romans. In 380 B.C., the Prænestines, having rejoined their ancient allies, opened a war with Rome; but were completely routed on the banks of the Allia by T. Quintius Cincinnatus, and beaten back to their own gates. They took a prominent part in the famous Latin war, 340 B.C. Having given shelter to the younger Marius in the year 82 B.C., this city was besieged by the forces of Sulla, and on its being taken all the inhabitants were put to the sword. A military colony was then established in their place, and soon the city began to flourish anew. Its elevated and healthy situation, at no great distance from the capital, made it a favorite place of resort of the Romans during summer. Augustus frequented it; Horace often found this city a pleasant retreat; and here Hadrian built an extensive villa. The Temple of Fortune is described by Cicero as an edifice of great antiquity as well as splendor, and its oracle was much consulted. The town became the stronghold of the family of Colonna in the middle ages; but was given to the Barberini family by Urban VIII.

PALESTRINA, Giovanni Pierluigi da, a distinguished musical composer of the 16th century. He derived his surname from the town of Palestrina, in the Roman states, where he was born in 1524. At the age of sixteen, he went to Rome, and studied music under Claude Goudimel, afterwards one of the victims of the St. Bartholomew massacre. In 1551 he was made *maestro di capella* of the Julian chapel, and in 1554 he published a collection of masses, so highly approved of by pope Julius III., to whom they were dedicated, that he appointed their author one of the singers of the pontifical chapel. Being a married man, he lost that office on the accession to the pontificate of Paul IV., in whose eyes celibacy was a necessary qualification for its duties. In 1555 he was made choir-master of Sta. Maria Maggiore, and held that position till 1571, when he was restored to his office at St. Peter's. In 1563, the council of Trent having undertaken to reform the music of the church, and condemned the profane words and music introduced into masses, some compositions of Palestrina were pointed to as models, and their author was intrusted with the task of remodeling this part of religious worship. He composed three masses on the reformed plan; one of them, known as the mass of pope Marcellus (to whose memory it is dedicated), may be considered to have saved music to the church by establishing a type infinitely beyond anything that had preceded it, and, amid all the changes which music has since gone through, continues to attract admiration. During the remaining years of his life, the number and the quality of the works of Palestrina are equally remarkable. His published works consists of 13 books of masses, 6 books of motets, 1 book of lamentatations, 1 book of hymns, 1 book of offertories, 1 book of magnificats, 1 book of litanies, 1 book of spiritual madrigals, and 3 books of madrigals. Palestrina must be considered the first musician who reconciled musical science with musical art, and his works form a most important epoch in the history of music. Equally estimable in private life, and talented as a musician, Palestrina struggled through a life of poverty during eight pontificates; his appointments were meager, and his publications unremunerative. He died in 1594. A memoir of his life and writings has been written by the abbé Baini.

PALES'TRO, a village of n. Italy, 4 m. e.s.e. of Vercelli, famous as the scene of a battle between the Sardinians and Austrians in May, 1859. On the 30th of that month the Piedmontese drove the Austrians from this village, and on the 31st defended it with great bravery against an Austrian attack. The Piedmontese, in the battle of the 31st, were assisted by 3000 French zouaves, and on that occasion the Austrians lost 2100 men killed and wounded, 950 prisoners, and 6 pieces of cannon. On June 1st the allies entered Novara. Pop. (comm.) about 4000.

PALETTE. See Painting.

PALEY, Frederick Apthorp, b. England, 1816; educated at Shrewsbury, and Cambridge. He left the university on account of his conversion to the Roman Catholic faith. He returned to Cambridge, subsequently, and lived there till 1874, when he was called to the chair of classical literature at the Roman Catholic university college at Kensington. He has been classical examiner at the university of London, and a member

of the civil service commission. He did very much to promote the restoration of churches and the advancement of church architecture; and, in this connection, he composed *The Ecclesiologist's Guide to Churches; The Church Restorers—a Tale; Remarks on the Architecture of Peterborough's Cathedral*, etc. Mr. P. edited Æschylus, Euripides, the *Iliad*, Theocritus, Propertius, etc., and also translated into English, Æschylus, and the *Odes* of Pindar, and, in verse, the 5th book of Propertius. He likewise translated Schömann's book on the assemblies of the Athenians, and produced a number of pamphlets and articles on classical subjects. He died in 1888.

PALEY, Dr. WILLIAM, a celebrated English divine, was born at Peterborough in 1743. His father was a Yorkshireman, and not long after Paley was born returned to his native parish of Giggleswick, one of the wildest and most sequestered districts in the West Riding, to become a master of the grammar-school there. Young Paley was brought up among the shrewd, hard-headed peasantry of Yorkshire; and it is probable that he either naturally possessed, or insensibly acquired their moral and mental characteristics. At all events, he soon became conspicuous in the family for his good sense; and when he left to enter Christ's college, Cambridge, as a sizar, in his 16th year, his father said: "He has by far the clearest head I ever met with." At Cambridge, Paley led for the first two years, a gay, idle, and dissipated life, but thereafter became a severe student, and took his bachelor degree in 1763 with highest honors. He then taught for three years in an academy at Greenwich. In 1765 he obtained the first prize for a prose Latin dissertation—the subject being, "A Comparison between the Stoic and Epicurean Philosophy with respect to the Influence of each on the Morals of a People," in which he characteristically argued in favor of the latter. Next year he was elected a fellow and tutor of Christ's, and also took the degree of M.A. In 1767 he was ordained a priest. His career as a college tutor, which lasted about ten years, was eminently successful; and it appears to have been during this period that he systematized his principles in moral and political philosophy. In 1776 Paley married, and was of course obliged to give up his fellowship, but was compensated by a presentation to the livings of Mosgrove and Appleby in Westmoreland, and of Dalston in Cumberland. Four years later he was collated to a prebendal stall in the cathedral church of Carlisle; in 1782 he became archdeacon, and in 1875 chancellor of the diocese. The last of these years witnessed the publication of his *Elements of Moral and Political Philosophy*. In this work he propounds his ethical theory, which is commonly called utilitarianism, but is really a mixture of utility and theology. He begins by renouncing the favorite doctrine of the moral sense, against which he adduces a series of strong objections. He then takes up the question of the source of obligation, and resolves it into the will of God, enforced by future punishment, admitting candidly that virtue is prudence directed to the next world. The will of God, in so far as it is not rendered explicit by revelation, is to be interpreted by the tendency of actions to promote human happiness; the benevolence of the Deity being supposed. Objection has frequently been taken to the principles on which Paley rests his system, but the lucidity and appositeness of his illustrations are beyond all praise. If his treatise cannot be regarded as a profoundly philosophical work, it is at any rate one of the clearest and most sensible ever written, even by an Englishman; and if it failed to sound the depths of "moral obligation," it at least brushed off into oblivion the shallow and muddy mysticism that had long enveloped the philosophy of politics. Paley's plain, sarcastic view of the "divine right of kings," which he puts on a level with the "divine right of constables," gave extreme offense to George III., but was nevertheless much admired by not a few of his majesty's subjects, and is now held by everybody to be beyond question. In 1790 appeared his most original and valuable work—the *Horæ Paulinæ, or the Truth of the Scripture History of St. Paul evinced by a Comparison of the Epistles which bear his name with the Acts of the Apostles, and with one another*. The aim of this admirable work is to prove, by a great variety of "undesigned coincidences," the improbability, if not impossibility, of the usual infidel hypothesis of his time—viz., that the New Testament is a "cunningly-devised fable." It was dedicated to his friend John Law, then bishop of Killala, in Ireland, to whose favor he had been indebted for most of his preferments. Paley's next important work was entitled *A View of the Evidences of Christianity* published in 1794. It is not equal in originality to its predecessor, but the use which the author has made of the labors of such eminent scholars as Lardner and bishop Douglas is generally reckoned most dexterous and effective. Later and keener criticism is indeed anything but satisfied with Paley's "evidences;" but in Paley's own day he was held to have achieved a splendid triumph over skeptics, and was handsomely rewarded. The bishop of London appointed him a prebend of St. Pancras; shortly after, he was promoted to the subdeanery of Lincoln (worth £700 per annum); Cambridge conferred on him the degree of D.D.; and the bishop of Durham the rich rectory of bishop Wearmouth (worth £1200 per annum), in consequence of which he honorably resigned his livings in the diocese of Carlisle. After 1800 he became subject to a painful disease of the kidneys; but, notwithstanding, he continued to write, and in 1802 published perhaps the most widely popular of all his works, *Natural Theology, or Evidences of the Existence and Attributes of the Deity*, which, however, is based, and to a large extent borrowed from the *Religious Philosopher*, the work of a Dutch philosopher named Nieuwentyt, an English translation of which appeared in 1718–19. The plagiarisms are most palpable, but have

been accounted for on the supposition that the *Natural Theology* was "made up" from his loose papers and notes written when Paley was a college tutor, and that he had forgotten the sources from which he derived them. It is also but fair to state that he has taken nothing which he has not greatly improved; *nihil tetigit, quod non ornavit.* A somewhat noted edition of this work, enriched, or at least expanded by annotations and dissertations, is that by lord Brougham and sir Charles Bell (1836–39). Paley died May 25, 1805. He had a family of four sons and three daughters. A complete edition of his works was published in 1838 by one of his sons—the Rev. Edmund Paley. The best biography is that by Meadley (1809).

PALFREY, John Gorham, d.d., ll.d.; b. Boston, Mass., 1796; graduated at Harvard in 1815, and studied for the ministry. In 1818 he was called to the pulpit of the Brattle Square church (Congregational-Unitarian), Boston, and in 1831 to the chair of sacred literature at the Harvard divinity school, where he remained till 1839. He was editor of the *North American Review*, 1859–42, and in the latter year gave a course of lectures before the Lowell institute, Boston, on *The Evidences of Christianity*, which appeared in book form the next year. He was elected to the Massachusetts legislature in 1842, and secretary of the commonwealth in 1844. He entered congress as a whig in 1847. He had already opposed the extension of slavery in a series of articles called *The Progress of the Slave Power;* and in Dec., 1847, he declined to vote for Robert C. Winthrop, the whig candidate for speaker. This step, with his well-known anti-slavery principles, cost him his seat at the election of 1848, after a close contest. He soon joined the free-soil party, was one of the editors of the *Commonwealth*, the Massachusetts organ of that party, and their candidate for governor. He acted with the republican party after its formation; but he did not again hold office, except from 1861–67, when he was postmaster of Boston. Dr. P. published *Lectures on the Jewish Scriptures and Antiquities*, 1838–52; *Harmony of the Gospels*, 1831; *Sermons*, 1834; *Academical Lectures; Remarks on the Proposed Constitutional Amendments;* and *The Relation Between Judaism and the History of New England*, 5 vols., 1858–90. The latter work is perhaps the best history ever written by an American, so far as original investigation of sources and impartiality are concerned; but is not brilliant in style. An abridgment of this history appeared in 1866, with the title *A History of New England from the Discovery by Europeans to the Revolution of the Seventeenth Century*, 4 vols. He died April, 1881.

PALGRAVE, Sir Francis, a distinguished antiquary and historian, was b. in London in July, 1788, of Jewish parentage, being the son of Meyer Cohen, a member of the stock exchange. He was educated at home under a Dr. Montucci, and even when a child showed extraordinary genius. When only eight years old, he made a translation into French of the *Battle of the Frogs and Mice* from the Latin version of Beauclerc, which was printed by his father in 1797. In 1803 he was articled as a clerk to a legal firm, and at the expiration of his articles, continued with the same firm as managing clerk until 1822, when he took chambers in the Temple, and was employed under the record commission. He had previously made himself known as a literary antiquarian, by the publication, in 1818, of some Anglo-Norman chansons, which he edited with much care. On the occasion of his marriage in 1823, he changed his name of Cohen to Palgrave, that being the maiden name of his wife's mother. He was called to the bar in 1827, and had considerable practice for some years in pedigree cases before the house of lords. In 1831 he published a *History of England*, which formed a part of the *Family Library;* and in 1832 appeared his *Rise and Progress of the English Commonwealth;* also *Observations on the Principles, etc., of New Municipal Corporations.* In that year he received the honor of knighthood, and was subsequently one of the municipal corporation commissioners. In 1835 the commissioners issued their report, which was signed, however, by only 16 of the members—sir Francis Palgrave being one of the four dissentients. In the same year he published a "Protest" against the commissioners' report, in which he called in question several of its statements, views, and arguments. In 1838, on the reconstruction of the record service, sir Francis Palgrave was appointed deputy-keeper of her majesty's records, and held that office during the rest of his life. Besides the works already mentioned, sir Francis Palgrave edited for the government the following: *Calendars of the Treasury of the Exchequer, Parliamentary Writs, Curia Regis Records*, and *Documents Illustrative of the History of Scotland.* In his private capacity he produced the *Merchant and the Friar*, an imaginary history of Marco Polo and Friar Bacon; also a *Hand-book for Travelers in Northern Italy*, and a *History of England and Normandy.* Of this last work a volume appeared in 1851, and a second in 1857; and the third and fourth volumes were published within three years after their author's death. Sir Francis Palgrave also wrote numerous articles for the *Edinburgh* and *Quarterly Reviews*, principally of an antiquarian character, but some of them purely literary or artistic. His great merit, in his historic writings, consists in the extensive use made by him of original documents, by aid of which he not only himself very much enlarged our acquaintance with the history and social aspects of the middle ages, but pointed out to others the advantage to be derived from a careful study of the original sources of information now known to abound among our public records. Sir Francis Palgrave died at Hampstead, on July 6, 1861.

PALGRAVE, Francis Turner, b. England, 1824; son of sir Francis Palgrave. He was educated at the Charterhouse and at Oxford; was for 5 years vice-principal of the training college for schoolmasters at Kneller hall, and afterward held a position in the educational department of the privy council. He was for a number of years private secretary to Earl Granville. He has published *Idylls and Songs*, 1854; *The Golden Treasury of English Songs*, 1861; *Art Catalogue of the Great Exhibition of* 1862; *Essays on Art*, 1866; *Hymns*, 1867; *Lyrical Poems*, 1871; and *Chrysomela, a Selection from the Lyrical Poems of Robert Herrick*, 1877. He was elected professor of poetry at Oxford in 1886.

PALGRAVE, William Gifford, b. England, 1826; son of sir Francis Palgrave, an English author, educated at the Charterhouse, obtained a scholarship at Trinity college, Oxford. He served in the Indian army, and in 1847 was commissioned 2d lieut. in the 8th Bombay native infantry. In 1853 he resigned his commission, and joined the society of Jesus connected with the Roman Catholic church, and went to the Jesuit seminary at Laval to study theology, residing most of his time in s. India during his engagement with that society, and stayed in Rome two years. He was ordained priest, resided several years in and near Damascus, acquired a complete mastery of the Arabic language and Mohammedan theology, and went voluntarily to join the mission at Syria and Palestine, for which, on account of his knowledge of Arabic, he was peculiarly fitted. In 1861 he delivered in Ireland a course of lectures on the massacres of the Christians in Syria. In 1862 he set out on an expedition from Maan on the w. border of the Sherarat desert, and traveled through the Wahabite kingdoms of central Arabia, disguised as a physician, and subsequently visited the provinces adjacent to the Persian gulf and Indian ocean. He was shipwrecked on the coast of Oman, returning to Europe through Bagdad and Aleppo in 1863. In 1864 he abandoned the order of Jesuits at Berlin. He had become so familiar with the Arabs and their language that he was looked upon by them as one of their own leaders and *sheikhs*, and he took part on several occasions in their religious services. In 1865–66 he was in Egypt on government business; and returning, was appointed to various consulates. In 1864 he published *A Personal Narrative of a Year's Journey Through Central and Eastern Arabia*, and was presented with the gold medal of the French geographical society. The book awakened some curiosity, as the precise object of his wanderings was not made public. In 1872 his *Essays on Eastern Questions* appeared, and *Hermann Agha, an Eastern Narrative*, a novel in 2 vols. In 1875 *Alkamah's Cave, a Story of Nejd*, was published; in 1876, *Dutch Guiana*, an account of a fortnight's stay there. He contributed valuable papers to the *Contemporary Review*, and was a fellow of the royal geographical and the royal Asiatic societies, and an honorary member of a number of scientific institutions in foreign lands. He d. in 1888.

PALI (a corruption of the Sanskrit *Prâkrit*, q.v.) is the name of the sacred language of the Buddhists. Its origin must be sought for in one or several of the popular dialects of ancient India, which are comprised under the general name of Prâkrit, and stand in a similar relation to Sanskrit as the Romance languages, in their earlier period, to Latin. It has been formerly assumed that Pâli arose from the special Prâkrit dialect called Mâgadhî, or the language spoken in Magadha; but, according to the view expressed by Lassen in his *Indische Alterthumskunde*, an hypothesis of this kind is not tenable, since the peculiarities of this dialect are not compatible with those of the Pâli language. The same distinguished scholar holds that the Prâkrit dialects, called the S'aurasenî and Mâhârâsht'rî, have a closer relation to the Pâli than any other, and that the origin of the latter must therefore be traced to the country of western Hindustan, between the Jumna river and the Vindhya mountain; though he observes, at the same time, that the Pâli is older than these dialects, and that the latter are therefore more remote from Sanskrit than the former. Whether the oldest works of the Buddhist religion were written in Pâli may be matter of doubt. It is more probable, on the contrary, that the language in which the founder of the Buddhist religion conveyed his doctrine to the people was not yet that special language, but a mixture of classical and popular Sanskrit, such as it still appears in the Buddhistic Sûtras. At a later period, however, Pâli became the classical language in which the Buddhists wrote their sacred, metaphysical, and profane works. The most important historical work written in this language is the *Mahâvans'a* (q.v.); other Pâli works, which have lately become known in Europe, and deserve especial mention, are the *Dhammapada*, on the Buddhist doctrine; and five *Jâtakas*, containing a fairy tale, a comical story, and three fables—both works edited and translated by V. Fausböll (Copen. 1855 and 1861). Pâli ceased to be a living language of India when Buddhism was rooted out of it; it was carried by the fugitive Buddhists to other countries, especially Ceylon, Burmah, and Siam, but in these countries, too, it had to give way before the native towns, in which the later Buddhist literature was composed.

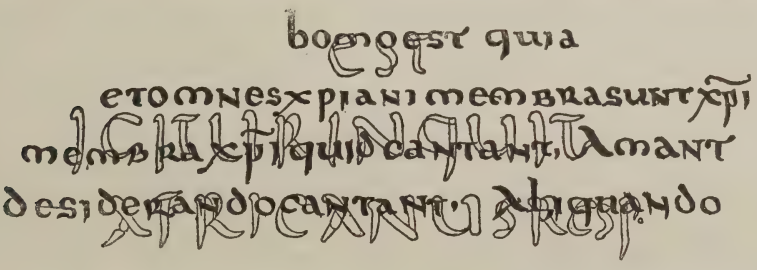
PALIA'NO, a walled t. of Italy in the province of Rome, 32 m. s.w. of Rome; pop. 5000. It has a large baronial castle which for a long time was the residence of the powerful Colonna family, descendants from Pierre Colonna, a vassal of the pope in the 11th c., among whose members were pope Martin V. and many prelates and generals.

PALICI, Lake of, or Nassia, near Catania in Sicily; emitting large quantities of carbonic gas. It was formerly used as an ordeal for persons accused of crime, who were pronounced innocent, if they escaped the mephitic vapor.

PALIKAO, Charles Guillaume Marie Appollinaire Antoine Cousin-Montauban, Comte de, (1796–1878); b. France. In 1860 he was made supreme in command of the French and English forces sent to China to "conquer a peace" and with relatively insignificant force captured forts, gained battles, and entered Pekin on Oct. 12 of that year. The Chinese government succumbed to the power of his small army and accepted the terms proposed. On his return to France in 1861 Napoleon presented him with the grand cross of the legion of honor, and gave him the title of Count of Palikao; that being the name of the place where the decisive battle with the Chinese was fought. In 1870 he succeeded M. Ollivier as premier, and acting war-minister at the beginning of the German war; and was associated with the misfortunes that followed the French army. He published a defense of his administration in 1871.

PAL'IMPSEST (Gr. *palimpsestos*, "rubbed a second time"), the name given to parchment, papyrus, or other writing material, from which, after it had been written upon, the first writing was wholly or in part removed for the purpose of the page being written upon a second time. When the MS. had been written with one species of ink employed by the ancients, which was merely a fatty pigment, composed chiefly of lampblack, and only coloring the surface, but not producing a chemical change, there was little difficulty in obliterating the writing. It was accomplished by the use of a sponge, and if necessary, of a scraper and polishing tool; and, where proper pains were taken, the erasure of the first writing was complete. But when the ink was mineral, its effect reached beyond the surface. In that case a scraping-tool or pumice-stone was indispensable; if these were hastily or insufficiently applied, the erasure was necessarily imperfect; and thus it often happens in ancient MSS. that, from the want of proper care on the part of the copyist in preparing the parchment for re-writing, the original writing may still be read without the slightest difficulty.

The practice of re-preparing used parchment for second use existed among the Romans. The material thus re-prepared was of course reserved for the meaner uses. We



meet frequent allusions in the classical writers, as Plutarch, Cicero (*Ad Familiares*, vii. 18), Catullus (xxii. 115), and others, to the palimpsest, in the sense of a blotter or first draft-book, on which the rough outline or first copy of a document was written, preparatory to the accurate transcript which was intended for actual use; and it appears equally certain that in many cases whole books were written upon re-prepared parchment or papyrus, not only among the Greeks and Romans, but also among the ancient Egyptians.

Of palimpsests of the classic period, however, it is hardly necessary to say no specimen has ever been discovered. It is to the necessities of the mediæval period that literature owes the unquestionably important advantages which have arisen from the revival of the ancient practice of re-preparing already used material for writing. Under the early emperors, the intercourse with Egypt and the east secured a tolerably cheap and abundant supply of papyrus (q.v.), which rendered it unnecessary to recur to the expedient of the palimpsest; and this became still more the case in the 5th and 6th centuries, when the tax on papyrus was abolished. But after the separation of the e. and w., and still more after the Mohammedan conquest of Egypt, the supply of papyrus almost completely ceased; and from the 7th c. in the west, and the 10th or 11th in the east, the palimpsest is found in comparatively frequent use; and its frequency in the 15th c. may be estimated from the fact that some of the earliest books were printed on palimpsest. Some writers have ascribed the prevalence of its use to the indifference, and even to the hostility of the monks and clergy to classical literature, and have attributed to their reckless destruction of classic MSS., in order to provide material for their own service-books and legendaries, the deficiencies in the remains of ancient learning which scholars have now to deplore. That some part of the loss may have so arisen it is impossible to doubt, although it is equally certain that we owe to the mediæval monks and clergy whatever of ancient literature has been preserved to our day. But the condition in which the existing palimpsests are uniformly found—for the most part mere fragments of the ancient

writers whose works they originally contained—goes far in itself to show that the MSS. which were broken up by the mediæval copyists, for the purpose of being re-written, were almost always already imperfect, or otherwise damaged; nor is there anything in the condition of any single palimpsest which has reached our day to justify the belief, that when it was taken up for the purpose of rescription, the original work which it contained was in a state at all approaching to completeness. Fortunately, however, there are many of the relics of ancient learning of which even the mutilated members have an independent value; and this is especially true of biblical MSS., particularly under the critical aspect, and in a still broader sense of all the remains of the ancient historians.

It will easily be understood, therefore, that the chief, if not the sole interest of palimpsest MSS. lies in the ancient writing which they had contained, and that their value to literature mainly depends on the degree of legibleness which the ancient writing still retains. It is difficult to make this fully intelligible to the reader without an actual inspection, but the facsimile on the previous page will furnish a sufficient idea. The particular passage selected for the illustration is from page 62 of the Vatican MS., from which Mai deciphered the fragments of the *De Republica*. The darker letters are those of the modern MS.; the faint lines are, as may be supposed, those of the original codex. Although so much more faint than the modern writing, they can be read with facility on account of their greater size. We shall transcribe both texts in ordinary characters. The original was as follows·

EST
IGITUR INQUIT
AFRICANUS RESP.
(The ordinary contraction for *Respublica*.)

The corresponding lines of the modern MS., which is from St. Augustine's commentary on the psalms, are:

homo est quia
et omnes Χρίανι (Christiani) membra sunt Χρι. (Christi)
membra Χρι. quid cantant. Amant
Desiderando cantant. Aliquando.

In this specimen, as very commonly occurs, the original writing is much larger than the modern; the modern lines and letters do not cover those of the old MS., but they follow the same order. In other specimens the new writing is transverse; in some, the old page is turned upside down. Sometimes, where the old page is divided into columns, the new writing is carried over them all in a single line; sometimes the old page is doubled, so as to form two pages in the new MS. Sometimes it is cut into two or even three pages. The most perplexing case of all for the decipherer is that in which the new letters are of the same size, and are written upon the same lines with those of the original MS. Examples of this are rare, and even when they occur, the difference between the form of the ancient characters, which are ordinarily uncial, and that of the modern, is in itself a great aid to the decipherer. Some variety, also, is found in the language of the palimpsests. In those which are found in the western libraries, the new writing is almost invariably Latin, while the original is sometimes Greek, and sometimes Latin. In the palimpsests discovered in the east the original is commonly Greek, the new writing being sometimes Greek, sometimes Syriac, sometimes Armenian; and one palimpsest, the material of which is papyrus, is found in which the original was the enchorial Egyptian language, while the modern writing is Greek.

The possibility of turning palimpsest MSS. to account as a means of extending our store of ancient literature was suggested as far back as the days of Montfaucon; but the idea was not turned to practical account till the latter part of the 18th century. The first palimpsest editor was a German scholar, Dr. Paul Bruns, who having discovered that one of the Vatican MSS. was a palimpsest, the effaced matter of which was a fragment of the 91st book of Livy's *Roman History*, printed it at Hamburg in 1773. In the field of discovery thus opened by Bruns but little progress was made until the following century, when Dr. Barrett of Trinity college, Dublin, published his palimpsest fragments of St. Matthew, and when palimpsest literature at once rose into interest and importance in the hands of the celebrated Angelo Mai (q.v.). A detailed account of Mai's successes will be given hereafter, when we shall enumerate the principal publications in this curious department of letters; and under his own name will be found the history of his personal labors. The great historian Niebuhr about the same time applied himself to the subject, and was followed by Blume, Pertz, Gaupp, and other German scholars, whose labors, however, were for the most part confined to the department of ancient Roman law. More recently, the discoveries of Dr. Tischendorf in biblical literature, and those of Dr. Cureton as well in sacred as in profane literature, have contributed still more to add importance to the palimpsest MSS. which have been supposed to exist in the monasteries of the Levant. Herr Mone has had similar success in the department of liturgical literature, and Dr. Frederick Augustus Pertz, son of the scholar already mentioned, may be said to have carried to its highest point the interest which attaches to these curious researches, by editing from a *thrice-written palimpsest* a very considerable series of fragments of the Roman annalist, Gaius Granius Licinianus.

It remains to enumerate briefly the most important palimpsest publications which have hitherto appeared, distributed according to the language of the effaced original.

I. Greek Palimpsests.—Among these, the first place of course belongs to the Greek biblical palimpsests, the earliest of which was (1) *Fragments of the Gospel of St. Matthew*, in facsimile as well as in *ordinary* type, printed from a palimpsest MS. of Trinity college, Dublin, by the rev. I. Barrett, D.D. (4to, Dublin, 1801). The original writing appears to be of the 6th century. Dr. Barrett's transcript of the text has not proved in all respects correct, but the original has since been carefully re-examined, and the ancient writing fully brought out. It is chiefly, however, to a collection of Syriac MSS. brought from the east that we are indebted for the more recent palimpsest restorations of the ancient biblical readings. In this line the chief discoverer has been Dr. Constantine Tischendorf. From his pen we have (2) the celebrated *Codex Ephremi* or *Codex Regius* of the royal library at Paris. This MS. had been early observed to be palimpsest, and the original Greek text was collated in part by Wetstein and by Küster. It was still more carefully examined by M. Hase in 1835; and finally, in 1840, by Dr. Tischendorf, by whom the New Testament was printed in 1843, and the fragments of the Old in 1845. The modern writing of this palimpsest consisted of the works of St. Ephrem the Syrian. (3.) *Fragmenta Sacra Palimpsesta* (4to, Leipsic, 1855), containing fragments of the books of Numbers, Deuteronomy, Joshua, Judges, Kings, Isaiah, together with 48 pages of fragments of the New Testament, the Gospels, the Acts, and the Epistles of St. Paul to the Corinthians and to Titus. The modern writing of these palimpsests was partly Greek, partly Armenian, and Arabic. (4.) *Fragmenta Evangelii Lucæ et Libri Genesis* (4to, Leipsic, 1857). The fragments of St. Luke's gospel amount to 95 pages. The volume also contains fragments of St. John's gospel and of Ezekiel and the Third Book of Kings. The modern writing is partly Syriac, partly Coptic. Along with these biblical palimpsests (5) may be classed another, the original of which, however, contains not only some Greek fragments, but also portions of the ancient Gothic version of the Bible by Ulphilas. The MS. from which this is taken is known from its place in the Wolfenbüttel library as the *Codex Guelpherbytanus*. It was first noticed in 1755 by Knittle, by whom a portion of the Gothic version was published in 1762. These fragments were reprinted in 1772, and again in 1805. The modern writing of the MS. consisted of the *Origenes* of Isidorus Hispalensis. A large addition to the text of Ulphilas was made in 1817 by Mai and Castiglione, from palimpsests discovered in the Ambrosian library at Milan; and the whole have since been combined into one edition by Dr. Gabelentz, and finally by Dr. Massmann (4to, Stuttgart, 1855). We may also mention under the same head some interesting Greek liturgical remains edited by F. I. Mone (Frankfort, 1850), from a palimpsest discovered at Carlsruhe.

In Greek classical literature, also, we owe something to the labors of palimpsest editors. From one of the Syriac MSS. already referred to, Dr. Cureton has edited large fragments of the *Iliad* of Homer, amounting in all to nearly 4,000 lines; and although all these, it need hardly be said, were known before, yet the text is of the utmost value as a source of criticism, being certainly of much greater antiquity than the very earliest known MSS. of the *Iliad*. A still larger and more original contribution to Greek classical literature was made by Mai in the 5th volume of his *Scriptorum Veterum Nova Collectio* (Rome, 1831–38). From a very large palimpsest discovered in the Vatican library he has printed in this volume copious fragments of almost all the Greek writers on Roman history—from the lost books of Polybius no less than 100 4to pages; 130 pages of Diodorus Siculus; 64 of Dionysius of Halicarnassus; 100 of Dion Cassius; together with considerable fragments of Appian, Iamblichus, Dexippus, Eunapius, and others. This is, perhaps, after the *De Republica* of Cicero, the most important accession to the existing store of classic learning which the palimpsests have hitherto supplied.

II. Latin Palimpsests.—(1.) The earliest fragment of Latin literature, printed from a palimpsest original, is the portion of the 91st book of *Livy* already referred to, published at Hamburg and also at Rome in 1773. It was re-edited in a more complete form by Niebuhr in 1820. (2.) Of the Latin palimpsests edited by Mai, the earliest were some fragments of lost orations of Cicero from two different palimpsests in the Ambrosian library at Milan, in the latter of which, the second writing consisted of the acts of the council of Chalcedon. These orations were published in two successive volumes in 1814. (3.) Eight orations of Symmachus (1815). (4.) The comedies of Plautus, including a fragment of the lost play entitled *Vidularia* (1815). (5.) The works of M. Corn. Fronto, together with the epistles of Antoninus Pius, Lucius Verus, M. Aurelius, and others (1815). (6.) The celebrated dialogue of Cicero, *De Republica*, from a palimpsest of the Vatican, the modern writing of which is the commentary of St. Augustine on the Psalms. There is none of Mai's publications which presents his critical abilities in so favorable a light as this precious volume, which appeared at Rome in 1821. (7.) Soon after the *De Republica* he published another volume from palimpsest sources, the most important of whose contents were some fragments of ancient Roman law, which prepared the way for the more distinguished success of Niebuhr; who, in a palimpsest of the library of Verona, recognized a portion of (8) the *Institutiones* of Gaius, and procured an accurate transcript for the press, which was printed at Berlin in 1820. The latest considerable Latin publication in this department is (9) *Gai Granii Liciniani Annalium quæ supersunt* (Berlin, 1857), edited from a palimpsest of the British museum by the younger

Pertz. This palimpsest, as was already stated, is a thrice written codex, the earliest and original contents being the *Annales* of Gaius Granius. The second writing was also in Latin, and the work is a grammatical treatise, of which the chapters *De Verbo* and *De Adverbio* are still legible. The most modern writing is Syriac, written in the cursive character. Gaius Granius is a writer named by Macrobius, of whom nothing else is known.

It will be gathered from the above that the ancient works recovered by means of palimpsest MSS. are all fragmentary, and one is naturally led to rate at a low value the result thereby obtained. But it must be remembered that in some of the departments to which these fragments belong, every scrap, no matter how trifling, has an independent value. So it is, for example, in biblical remains—a single text may present a valuable reading, the merest fragment may throw light on an important critical question. In history, in like manner, a small fragment may disclose an interesting fact, or supply a significant commentary upon facts otherwise ascertained. And as regards critical uses especially, it must not be forgotten that the obliterated text of the palimpsest MSS. for the most part, far exceeds in antiquity the very oldest known codices which we possess, and is, probably, second only in age to the papyri of Herculaneum.

The method of treating palimpsest MSS., with a view to deciphering their contents, has been fully described by different editors. Mai, after having washed the palimpsest with an infusion of galls, exposed it to the light and air, and, generally speaking, found this sufficient for his purpose. Peyron washed the parchment in water, afterwards in dilute muriatic acid, and finally in prussiate of potash. A mixture, compounded on this principle, is called from its inventor, M. Gioberti, *tinctura Giobertina*. Sometimes the same treatment does not succeed equally well on both sides of the parchment; the inner surface, from its softer texture, sometimes requiring a more active preparation. When the ink contained animal substances, as milk, or the blood of the cuttle-fish, Dr. Mone plunged the parchment in a close vessel filled with oil, which he heated to a temperature of 400° R. In the prefaces of Mai's volumes will be found many amusing and interesting facts illustrating the difficulties which attend this curious branch of literary labor.

PALINDROME (Gr. *palin*, backwards, and *dromos*, a running), the name given to a kind of verse very common in Latin, the peculiarity of which is that it may be read the same backwards as fowards. A few examples will suffice.

Si bene te tua laus taxat sua laute tenebis.
Et necat eger amor non Roma rege tacente,
Roma reges una non anus eger amor.

A Roman lawyer gets the credit of the following:

Si nummi immunis,

which Camden translates:

Give me my fee, and I warrant you free.

It is said that in the reign of queen Elizabeth a certain lady of rank, having been compelled to retire from the court on account of some *fama*, the truth of which she denied, took for her motto:

Ablata at alba.
Retired but pure.

The English language has few palindromes, but one at least is inimitable. It represents our first parent politely introducing himself to Eve in these words:

Madam, I'm Adam.

Compare Henry B. Wheatley's book on *Anagrams* (1862).

PALINGENE'SIA (Gr. *palin*, again, and *genesis*, birth) is a term that appears to have originated among the Stoics, who employed it to denote the act of the demiurgus, or creator, by which, having absorbed all being into himself, he reproduced it in a new creation. The occurrence of the word in the New Testament (Titus, iii. 5, where it is used to denote regeneration) has given it a place in Christian theology, and divines have variously used it to express the resurrection of men, the new birth of the individual soul, and the restoration of the world to that perfect state that it lost by the fall—"the new heavens and the new earth wherein dwelleth righteousness." Savans have also applied the term to designate both the great geological changes which the earth has undergone and the transformations in the insect kingdom, such as of caterpillars into butterflies, etc

PALINU'RUM, or CAPO PALINURO, a promontory of Italy, on the coast of Lucania in the Tyrrhean sea, n.w. of the entrance to the gulf of Policastro; also called capo Spartimento. It was named in honor of Palinurus, the pilot of Æneas, said to have been buried here, where some ruined walls bear the name of the tomb of Palinurus. During the first Punic war, B.C. 253, a large Roman fleet was wrecked on this point, and 150 vessels lost; and, B.C. 36, a portion of the fleet of Octavius came to wreck by running on the rocks.

PALISADE, a paling of strong timber, used in fortification. For the mode in which the palisade is employed, see FORTIFICATION, under the head *Stockade*.

PALISADES, THE, name by which is known the line of rocks on the west side of the Hudson river, where a portion of the Appalachian mountain system crossing New York state divides abruptly to allow the passage of the water. The cliffs rise perpendicularly from the river in some places to the height of 500 feet, and stretch in an unbroken line along the bank from fort Lee for more than twenty miles. These rocks are columnar in form, and are assigned to the Triassic age, being of a reddish-brown sandstone mixed with a considerable portion of igneous rock. The sandstone having been worn away in many places by the action of the water, these rocks stand up conspicuously, giving the appearance of a stockade, whence their name from the French word *palissade*, a hedge-row of trees.

PALISANDER WOOD, the continental name for rosewood (q. v.). By some of the French cabinet-makers, the name *bois de Palisandre* is also applied to violet wood and to a kind of striped ebony.

PALISOT, AMBROISE MARIE FRANÇOIS JOSEPH BEAUVOIS DE, 1752–1820; b. France; educated for the practice of law; receiver-general of the forests and domains of Picardy, Flanders, and Artois, and in 1781 made a correspondent of the academy of sciences for essays on cryptogamous and sarmentose plants. In 1786 he went to Africa with a returning negro prince, penetrated to the kingdoms of Oware and Benin, and made a great collection of strange plants and insects, which were captured and destroyed by the British. He went thence to San Domingo, became a member of the colonial government, and in 1791 was sent to Philadelphia to seek aid against the negroes who were in revolt. On his return he was arrested by them, freed by a negress who had been freed by him, escaped to the United States, where he taught for a living, and afterwards traveled as a botanist, and returned to France in 1798, where he was subsequently a member of the institute and of the council of the university. His works, illustrated, are: *Flore d'Oware et de Benin*, 2 vols., Paris, 1804–21; *Insectes recueillis en Afrique et en Amérique*, 1805-21, and *Muscologie, ou traité sur les mousses*, 1822.

PALISSY, BERNARD, a French potter, famous for his glass paintings and beautiful figured pottery, was b. near Agen, now in the department of Lot-et-Garonne, France, about 1510, and at an early age was apprenticed to a potter. He devoted himself to chemical researches for the improvement of his art, and made many journeys through France and Germany for the same purpose; at the same time carrying on the business of a land-surveyor. An enameled cup of "Faience," which he saw by chance, inspired him with the resolution to discover the mode of producing white enamel. Neglecting all other labors, he devoted himself to investigations and experiments for the long period of 16 years. He had by this time exhausted all his resources, and for want of money to buy fuel was reduced to the necessity of burning his household furniture piece by piece; his neighbors laughed at him, his wife overwhelmed him with reproaches, and his starving family surrounded him crying for food; but in spite of all these discouragements he persisted in the search, and was in the end rewarded by success. A few vessels adorned with figures of animals, colored to represent nature, sold for high prices, and enabled him to complete his investigations, after which he became famous; and though a Huguenot, was protected and encouraged by the king and the nobility, who employed him to embellish their mansions with specimens of his art. He was lodged in or near the Tuileries, and was specially exempted by queen Catherine from the massacre of St. Bartholomew, more from a regard to her own benefit than from kindness. In March, 1575, he commenced a course of lectures on natural history and physics, and was the first in France to substitute positive facts and rigorous demonstrations for the fanciful interpretations of philosophers. In the course of these lectures, he gave (1584) the first right notions of the origin of springs, and the formation of stones and fossil shells, and strongly advocated the importance of marl as a fertilizing agent. These, along with his theories regarding the best means of purifying water, have been fully supported by recent discovery and investigation. In 1588 he was arrested and thrown into the Bastille as a heretic, but died in 1589 before his sentence was pronounced.

Palissy left a collection of objects of natural history, the first that had been formed in France. His works are at the present day almost beyond price, and his ornaments and arabesques are amongst the most beautiful of the "renaissance."

PALIU'RUS, a genus of trees and shrubs of the natural order *rhamnaceæ*, nearly allied to *zizyphus* (see JUJUBE), but very different in the fruit, which is dry, orbicular, and girded with a broad membranous wing. *P. aculeatus* is often called CHRIST'S THORN, and by the Germans, JEWS' THORN (*Judendorn*), from an imagination that it supplied the crown of thorns with which our Savior was crowned. It is a deciduous shrub or low tree, with slender, pliant branches, and ovate 3-nerved leaves, each of which has two sharp spines at the base, one straight and the other re-curved. It is a native of the countries around the Mediterranean, of India, and many parts of Asia. It is often used for hedges in Italy and other countries; its sharp spines and pliant branches admirably adapting it for this purpose. The fruit has a singular appearance, being flat and thin, attached by the middle to the foot-stalk, the middle being raised like the crown

of a hat, whilst the expansion resembles the brim. The seeds are sold by the druggists of the east, and are used medicinally, but their qualities are doubtful.

PALK STRAIT, or PALK'S PASSAGE, the northern portion of the passage between the s. coast of Hindustan and the island of Ceylon. This passage is continued southward by the gulf of Manaar. It is from 40 to 80 m. in width, and is 80 m. in length. It is so shallow—in some places being no more than two fathoms in depth—that it cannot be navigated in safety by large vessels. In Palk strait there are several pearl fisheries.

PALL (Lat. *pallium,* also *palla,* a cloak), the name given in English to two very different portions of the vesture employed in the religious use of the Roman and some other churches. One of these is the *funeral pall,* an ample covering of black velvet or other stuff, which is cast over the coffin while being borne to burial. The ends of the pall are held during the funeral procession by the most distinguished among the friends of the deceased, generally selected from among those unconnected by blood. In its second and most strictly liturgical use, the word pall is applied to one of the coverings used at the altar in the celebration of the mass. Primitively, as appears from Optatus and other early writers, the altar was covered with a large linen cloth—called by the Latins *pallium,* and by the Greeks *eileton*—the extremities of which were folded back so as to cover the bread and wine prepared for the celebration of the eucharist. In later times a separate covering was employed for the sacramental chalice, to which latter the name pall is now reserved in the use of the Roman church. The modern Roman pall is a square piece of linen cloth—sometimes limber, sometimes made stiff by inserting pasteboard—sufficiently large to cover the mouth of the chalice. The upper surface is often of silk embroidered, or of cloth of gold. The surface in contact with the chalice must always be of linen.

PALL, in heraldry, the upper part of a saltire conjoined to the lower part of a pale. It appears much in the arms of ecclesiastical sees.

PALLADIO, ANDREA, a famous Italian architect, was born at Vicenza, Nov. 30, 1518. After having studied with the greatest care the writings of Vitruvius, and the monuments of antiquity at Rome, he settled in his native city, and first acquired a reputation by his restoration of the basilica of Vicenza. Pope Paul III. then invited him to Rome, designing to intrust him with the execution of the works then going on at St. Peter's, but, his holiness dying before the arrival of Palladio, the latter had to return home. He was employed for many years in the construction of numerous buildings in Vicenza and the neighborhood, in all of which he displayed the most exquisite taste combined with the most ingenious and imaginative ornamentation. His style, known as the Palladian, is a composite, and is characterized by great splendor of execution and justness of proportion, and it exercised an immense influence on the architecture of Northern Italy. His principal works are the Rotonda Capra, outside Vicenza; the palazzo Chiericado and the palazzo Tiene, in the city; the palazzo Barbara, at Maser in the Trevigiano, the Teatro Olympico at Vicenza (his last work), the palazzo at Montagnana for Francesco Pisana; the churches of San Giorgio Maggiore and Il Santissimo Redemptore at Venice, the atrium and cloister at the convent Della Carità, and the façade of San Francesco della Vigna in the same city. Palladio died at Venice, Aug. 19, 1580. He wrote a work on architecture, which is highly prized. The best edition is that published at Vicenza in 4 vols., 1776.

PALLADIUM (symb. Pd, eq. 53—new system, 106.2—spe. grav. 11.4) is one of the so-called noble metals, and in its color and ductility closely resembles platinum. It is not fusible in an ordinary wind-furnace, but melts at a somewhat lower temperature than the last-named metal, and when heated beyond its fusing point, it volatilizes in the form of a green vapor. It undergoes no change in the open air at ordinary temperatures; but at a low red heat it becomes covered with a purple film, owing to superficial oxidation. It is readily soluble in hot nitric acid, and in aqua regia. It combines readily with gold, which it has the property of rendering brittle and white. (When it forms 20 per cent of the mass, the alloy is perfectly white.) When alloyed with twice its weight of silver, it forms a ductile compound, which has been employed for the construction of small weights; but for this purpose aluminium is superior. Professor Miller states that it "has been applied in a few cases to the construction of graduated scales for astronomical instruments, for which, by its whiteness, hardness, and unalterability in the air, it is well adapted;" its scarcity must, however, prevent its general use for this purpose.

It was discovered in 1803 by Wollaston in the ore of platinum, of which it seldom forms so much as 1 per cent. Another source of this metal is the native alloy which it forms with gold in certain mines in Brazil, and which is termed *ouro poudre;* and it is from this alloy that the metal is chiefly obtained.

Palladium forms with oxygen a monoxide, PdO, which is the base of the salts of the metal; a dioxide, PdO_2; and according to some chemists, a suboxide, Pd_2O. On exposure to sufficient heat, these compounds give off their oxygen, and yield the metal. The salts of the protoxide are of a brown, red, or green color.

PALLADIUM, among the ancient Greeks and Romans, an image of Pallas, who was generally identified with Athene, upon the careful keeping of which in a sanctuary the public welfare was believed to depend. The Palladium of Troy is particularly cele-

brated. According to the current myth, it was thrown down from heaven by Zeus, and fell on the plain of Troy, where it was picked up by Ilus, the founder of that city, as a favorable omen. In the course of time, the belief spread that the loss of it would be followed by the fall of the city; it was therefore stolen by Odysseus and Diomedes. Several cities afterwards boasted of possessing it, particularly Argos and Athens. Other accounts, however, affirm that it was not stolen by the Greek chiefs, but carried to Italy by Æneas; and the Romans said that it was preserved in the temple of Vesta, but so secretly that even the pontifex maximus might not behold it. All images of this name were somewhat coarsely hewn out of wood.

PALLA'DIUS, one of the early Christian fathers, born, as is supposed, in Galatia, Asia Minor, about 367 A.D. He was distinguished by an intense admiration of asceticism, and, assuming the garb of a monk, he started on foot at the age of 20 to visit the cells of the most famous monks in different parts of the Roman empire. In 400 he was appointed bishop of Helenopolis in Bithynia. Here he recorded what he had seen and heard among the monks, and in 420 the book appeared, addressed to Lausus, a chamberlain at the imperial court, and hence named the *Lausiac History*. During the latter part of his life, he was bishop of Aspona in Galatia. He died about 431. The *Lausiac History* in the original Greek, and in an old Latin version, is contained in the *Bibliotheca Patrum*. He was an adherent of Origen and an enemy of Jerome.

PALLADIUS (Sophista), a Greek medical writer who lived at some time between the 3d and 9th centuries. The only record of him is that he was the author of three Greek treatises extant: the first, *Scholia in Librum Hippocratis*, "*De Fracturis*;" the second, *In Sextum* (*Hippocratis*) "*Epidemiorum*" *Librum Commentarius;* the third, *De Febribus Concisa Synopsis.*

PALLA'DIUS, Rutilius Taurus Æmilianus, a Roman author, who probably lived in the 4th c. A.D., under Valentinian and Theodosius. He wrote a work, *De Re Rustica* (On Agriculture), in 14 books, the last of which is a poem of 85 elegiac couplets. It is, from a literary and grammatical point of view, full of faults; but as it was a complete calendar of Roman agriculture, it was very useful for its time, and was much read and followed during the middle ages. Palladius has borrowed largely from his predecessors. The best edition is that by J. G. Schneider in his *Scriptores Rei Rusticæ Veteres Latini* (4 vols., Leip. 1795).

PALLAH, *Æpyceros melampus*, a species of antelope found in s. Africa, having long, branching, and ringed horns. It is of a dark-red color, and by the Dutch is called *roode bok*. Its flesh, though not very palatable, is eaten by the natives.

PALLANZA, a t. in the province of Novara, Italy, on a headland in Lago Maggiore, nearly opposite the Borromean islands; 27 m. w. by n. of Como, pop. about 5,300. The town is well built, has an ancient massive tower used as a belfry, two convents, a town-house surrounded by arcades resting on pilasters, and a well arranged prison. It is quite a resort for travelers on account of its fine climate and picturesque beauty. The finest granite quarries in Italy are found in the province; also a fine quality of white marble.

PALLAS. See Minerva.

PALLAS, Peter Simon, an eminent traveler and naturalist, was born Sept. 22, 1741, at Berlin, Germany, where his father was a physician. He studied medicine, natural history, and other branches of science at the universities of Berlin, Göttingen, and Leyden, and was employed in classifying many valuable collections of objects of natural history, both in Holland and England. He gained a high reputation by the publication of his *Elenchus Zoophytorum* (Hague, 1766), a work still much valued; *Miscellanea Zoologica* (Hague, 1766), and *Spicilegia Zoologica* (2 vols., Berlin, 1767–1804). The empress Catharine invited him, in 1768, to St. Petersburg, where he was well received, and had honors conferred on him, and he was subsequently appointed naturalist to a scientific expedition bound for Siberia, there to observe the transit of Venus. Pallas spent six years on this journey (1768–74), exploring in succession the Ural mountains, the Kirghis steppes, great part of the Altaian range, and the country around lake Baikal as far as Kiachta, great part of Siberia, and the steppes of the Volga, returning to St. Petersburg in 1774, with an extraordinary treasure of specimens in natural history, which form the nucleus of the museum of the academy of St. Petersburg. His travels (*Reisen durch verschiedene Provinzen des Russ. Reichs*) were published at St. Petersburg (1771–76), in 3 vols., and were followed by his *Sammlung historischer Nachrichten über die Mongol. Völkerschaften* (2 vols., St. Petersb. 1776–1802), and his *Neue nordische Beiträge zur physikalischen und geographischen Erd-und Völkerbeschreibung, Naturgeschichte und Oekonomie* (6 vols., St. Petersb. 1781–93). Without positively neglecting any branch of natural history, he now devoted himself more particularly to botany; and his magnificent *Flora Rossica* (St. Petersb. 1784–88), a work which, however, he was not able to complete, and his *Species Astragalorum* (14 parts, Leip. 1800–4), were among the results of his studies. He published also *Icones Insectorum præcipue Rossiæ Sibiriæque Peculiarium* (Erlangen, 1781, 1783, and 1806); and contributed to a glossary of all the languages of the Russian empire, which was published at St. Petersburg. As he wished to live in the Crimea, the empress Catharine presented him with an estate in the finest part of that peninsula, where he resided generally from 1796. His *Travels in the South of Russia* were published in 1799 (2 vols., Leip., with

volume of plates). After the death of his wife, he went to Berlin, where he died Sept. 8, 1811. A large and valuable work of his, on the fauna of Russia, has not yet been published.

PALLAVICI'NO, FERRANTE, an Italian, b. at Piacenza about 1618. He was well educated, entered the monastery of the Augustinian friars at Milan, and joined the house of his order at Venice. For a few years he bore a high character for piety and learning, but a love affair led him to desert the monastery, and he gave himself up to a course of licentiousness, supporting himself for a time by writing obscene books. He wrote a collection of satirical letters called *The Courier Robbed of his Mail,* in which he inveighed bitterly against the Spaniards, but the secretary of the republic declined giving it his *imprimatur.* He afterwards went to Germany as chaplain to the duke of Amalfi, and on his return resolved vengeance on all who had prevented the publication of his MSS. Recasting and enlarging his *Courier,* he induced his bookseller to print it secretly. But a pretended friend, acting as a spy, informed the pope's nuncio, and the author was cast into prison. Having obtained his liberty, he wrote a piece called *La Buccinata overo Butarella per le api Barbarini,* satirizing severely his enemies, the Barberini, with a dedication expressing great contempt to the nuncio Vitelli. The nuncio, in revenge, bribed a Frenchman to decoy the poet into the hands of a gang of *sbirri.* He was taken to the papal territory of Avignon and imprisoned. There was a mock trial, he was condemned for apostasy and treason, and beheaded Mar. 5, 1644, at the age of 26. He wrote a number of small pieces characterized by the grace and genius which appear in his larger works. His *Opere Permesse,* edited by Brusoni, with a life of the author, was published in 4 vols. in 1665.

PALLAVICINO, SFORZA, an Italian historian, son of the marquis Alessandro Pallavicino of Parma, was b. at Rome, Italy, Nov. 20, 1628. Much to the disgust of his father, he took priest's orders, and held several important ecclesiastical appointments during the pontificate of Urban VIII. In 1637 he became a member of the Jesuit society, and was created a cardinal in 1659 by pope Alexander VII. He died at Rome, June 5, 1667. Pallavicino was a fine scholar, and often presided in the famous Roman academy of the *Umoristi.* The best known of all his writings is his *Istoria del Concilio di Trento* (Rome, 1656–57), intended as a reply to the still more celebrated and liberal, although, by Catholics, deeply suspected, work of Paul Sarpi. Among his other works may be mentioned *Vindicationes Soc. Jes.* (Rome, 1649); *Arte della Perfezione Cristiana,—Fasti Sacri* (the unpublished MS. is in the library of Parma); *Ermenegildo,* a tragedy (Rome, 1644); *Avvertimenti Grammaticali* (Rome, 1661); *Trattato dello Stilo e del Dialogo* (Rome, 1662), and *Lettere* (Rome, 1668).

PALLI, a village of central India, in Indore, stands on the right bank of a branch of the Luni river, in lat. 25° 48′ n., long. 73° 24′ east. It is an entrepôt for the opium sent from Malwa to Bombay, and is the seat of extensive commerce. It imports European manufactured goods extensively, and is estimated to contain about 50,000 inhabitants.

PALLIOBRANCHIA'TA. See BRANCHIOPODA.

PAL'LISER, JOHN, b. Ireland, 1817; son of lieut.-col. Wray Palliser; came to Canada in early life, passing a number of years among the Indians of the n.w., exploring that region to the Pacific ocean. In 1857–60 he was commissioner for the British, to determine the boundary line between the United States and the Hudson bay lands w. of lake Superior, from that lake across the main chain of the Rocky mountains, thence to the sea coast or Cascade range. The parliamentary papers reporting the progress of the explorations were published 1859, and a detailed account of the geography, agricultural resources, etc., appeared in 1861. He published also *The Solitary Hunter, or Sporting Adventures in the Prairies* (1853). He returned to Ireland and served as high sheriff of the co. of Waterford. He d. in 1887.

PAL'LISER, Sir WILLIAM, 1830–82; b. Dublin, Ireland; educated at Rugby; Trinity college, Dublin; Trinity hall, Cambridge, and the Staff college, Sandhurst. He entered the rifle brigade as ensign in 1855, and was transferred to the hussars in 1858. He retired from the service in 1871, and was knighted in 1873. He has introduced a number of inventions, among which are the "Palliser projectiles," used to pierce armor-plated ships, and of far greater efficiency than steel shell and shot; improved rifling in the heavy wrought iron cannon used in iron-clads, and the sea-front of forts; screw bolts for fastening the armor to the iron-plated defenses of harbors and dock yards; the rifled compound guns known as "Palliser guns," into which the old smooth-bore cast-iron guns are converted.

PAL'LIUM, the name given in the Roman Catholic church to one of the ecclesiastical ornaments worn by the pope, by patriarchs, and by archbishops. Its use is held by Roman Catholics to descend from a very early period. It is worn by the pope at all times, as a symbol of his reputed universal and abiding jurisdiction. By archbishops it cannot be worn until it has been solemnly asked for and granted by the pope, and even then only during the solemn service of the great church festivals, and on occasions of the ordination of bishops or of priests, and other similar acts of the archiepiscopal order. The pallium is a narrow annular band of white woolen web, about 3 in. wide, upon which black crosses are embroidered, which encircles the neck of the archbishop, and from which two narrow bands of the same material depend, one falling over the breast, the

other over the back of the wearer. Its material is the subject of much care and ceremonial. It is made wholly or in part from the wool of two lambs, which are blessed annually on the festival, and in the church of St. Agnes. During the night of the vigil of the feast of St. Peter and St. Paul, the *pallia* made of this wool are placed on the altar above the tomb of these apostles, and on the feast of St. Peter and St. Paul, are delivered by the pope to the subdeacon, whose duty it is to keep them in charge. Within three months of his consecration, every new archbishop is obliged to apply to the pope, in person or by proxy, for the pallium; nor is it lawful for him, until he shall have received it, to exercise any act of what is properly archiepiscpal, as contradistinguished from episcopal, jurisdiction. Thus, he cannot, for example, call a *provincial* synod. The pallium cannot be transferred from one archbishop to another, but must be received direct from the pope. On the archbishop's death, his pallium is interred with him. Its use is held to symbolize the office of the "good shepherd" bearing the lost sheep on his shoulders, and is connected by some writers with the vesture of the Jewish high-priest in Exod. xxviii. 4. In the mediæval church, the granting of the pallium to archbishops was one of the chief occasions of the tribute which was paid by the national churches to the support of the great central office and dignity of the papacy. In some sees, as, for instance, those of the great prince-bishops of the Rhine, the tribute was as much as 20,000 florins. Roman Catholics, however, maintain that this tribute was not a *payment* for the pallium, but an *offering* to the holy see, made on occasion of the grant of that emblem of jurisdiction.

PALL-MALL. See MALL.

PALM, a measure of length, originally taken from the width of the hand, measured across the joints of the four fingers. In Greece, it was known as *palaistē*, and was reckoned at 3 in., or $\frac{1}{8}$ of a cubit, which was their standard unit. The Romans adopted two measures of this name—the one was the Greek *palaistē*, and was called *palmus minor;* the other, which was not introduced till later times, was called *palmus major*, or *palma*, and was taken from the *length* of the hand, being therefore usually estimated at three times the length of the other. At the present day, this measure varies in a most arbitrary manner, being different in each country, and occasionally varying in the same. The English palm, when used at all, which is seldom, is considered to be the fourth part of an English foot or 3 inches. The following is a list of the most common measures to which the name palm is given:

	Value in Eng. inches.
Greek *palaistē* =	3.03375
Roman *palmus*, or lesser palm =	2.9124
" *palma*, or greater palm =	8.7372
English palm ($\frac{1}{4}$ of a foot) =	3.0000
Hamburg palm ($\frac{1}{8}$ of a foot) =	3.7633
Amsterdam "round" palm =	4.1200
" "diameter" palm =	11.9687
Belgian palm, Lombard palm } properly the *decimètre* =	3.9371
Spanish palm, or *palmo major* =	8.3450
" " or *palmo minor* =	2.7817
Portuguese palm, or *palmo de Craveira* =	8.6616

In Germany and the low countries the palm is generally confined to wood-measurement, while in Portugal it used to be the standard of linear measure.

PALM, JOHANN PHILIPP, a book-seller of Nuremberg, who has acquired an historic celebrity as a victim of Napoleonic justice in Germany. He was born at Schorndorf, Bavaria, in 1768, and succeeded his father-in-law, Stein, as a bookseller in Nuremberg, the old name of the firm being retained. In the spring of 1806, a pamphlet, entitled *Deutschland in seiner tiefsten Erniedrigung* (Germany in its deepest humiliation), which contained some bitter truths concerning Napoleon, and concerning the conduct of the French troops in Bavaria, was sent by this firm to a bookseller in Augsburg in the ordinary course of trade, and, as Palm to the last moment of his life averred, without any regard, on his part, to its contents. Napoleon's police traced it to the shop in Nuremberg, and an investigation was ordered, from which nothing resulted. Palm was in Munich, and perhaps escaped imprisonment there because his name was not the same with that of the firm; but, supposing all safe, he returned to Nuremberg, and was there taken prisoner, and examined before Marshal Bernadotte, whose adjutant represented his arrestment as the consequence of direct orders from Paris. An extraordinary court-martial, held at Brunau, to which he was removed, condemned him to death (Aug. 25, 1806), no advocate being heard in his defense. All intercession on his behalf was in vain. Gen. St. Hilaire declared that the orders of the emperor were positive; and the sentence was executed at two o'clock on the same day on which it was pronounced. Subscriptions were raised for the family at St. Petersburg, to which the emperor and empress of Russia personally contributed; in England; and in several German towns, as Berlin, Leipsic, Dresden, and Hamburg. Some French writers have endeavored to throw the blame of this murder on Marshal Berthier, instead of Napoleon.

PALMA. See CANARIES.

PALMA, the capital of the island of Majorca (q.v.) and of the province of Baleares, is situated on the s.w. coast of the island, on the gulf of Palma, which, between capes Figuera and Blanco, is 18 m. long, and sweeps 12 m. inland. The city is surrounded by orange plantations, and is walled and fortified. The houses, some of which are built of marble, are mostly in the Moorish style of architecture, and a number of the streets are wide and regular. It is the see of a bishop, and contains a Gothic cathedral, simple but beautiful in style, and with a spire which, from the delicate and airy character of its construction, is called the Angel's tower. Besides other ecclesiastical edifices, the town contains an exchange—a beautiful and ornate structure in Germano-Gothic—the governor's palace, an academy of medicine and surgery, and a large number of excellent educational institutions, including three *colegios.* In the port, a mole, 500 yds. in length, runs out from the bastions facing the s.; and on each side of it are ship-building yards, for the construction of the swift lateen vessels so well known in the Mediterranean. The port is small. The first railway in Majorca was opened from Palma to Inca in 1875. Wool, silk, and the cordage for the Spanish navy are manufactured. Though one of the chief marts of Europe in the 13th c., Palma now carries on but little commerce. Construction of docks was commenced in 1894. Pop. 60,514.

PALMA, or PALMA DI MONTECHIARO, seaport and t. of Sicily, in the province of Girgenti, 13 m. s.e. of the t. of Girgenti, near the s.w. coast. It is entirely a modern town, its foundation dating only from 1637. There is a trade in almonds, dried fruits, soda, wine, and sulphur. Pop. 11,702.

PALMA, JACOPO, the elder, an eminent Italian painter, was b. near Bergamo, Italy, about 1544. Imitating the grace of Titian, and the clear expression and lively coloring of Giorgione, he is distinguished by elaborate refinement and a harmony of tints. Among other great pictures he painted "Santa Barbara Formosa" at Venice, and a "Madonna" for San Stefano di Vicenza. He is also the supposed artist of a portrait which Vasari eulogizes as "a performance of astonishing perfection and singular beauty." His pictures are found in the galleries of Dresden, Vicenza, Venice, Vienna, and other European towns. He d. 1626.

PALMA CHRISTI. See CASTOR-OIL PLANT.

PALMARO'LI, PIETRO, 1750–1828; b. Italy; the first to transfer frescos from the wall to canvas. The first work which he transferred in this manner was the "Descent from the Cross," by Daniele da Volterra, in the church of Trinitá de' Monti in Rome. This was in 1811, and the work still remains, though not in the chapel where it was painted. This transfer created great interest throughout Italy. Palmaroli afterwards transferred a number of famous works in Rome and Dresden.

PALMAS, CAPE. See CAPE PALMAS.

PALMBLAD, WILHELM FREDRIK, a Swedish writer of considerable merit, and one of the earliest and the most zealous promoters of the literature of his native country, was b. in 1788 at Liljested, Sweden, where his father held a post under the government. While still a student at Upsala, Palmblad purchased, in 1810, the university printing-press, and immediately entered upon the publication of several literary and scientific periodicals, which, being the first of the kind that had ever appeared in the Swedish language, attracted considerable notice, and by their intrinsic merit, contributed materially to the diffusion of general information and the creation of a taste for learning among the general Swedish public. The earliest of these were the *Phosphorus,* a mixed literary journal; the *Poetisk Kalender,* an annual; and the *Svensk Litteratur Tidnig,* a literary review, which lasted till 1824. The Swedish writers Atterbom and Hammarskjold were associated with Palmblad in the management of these journals, and, like him, directed all their efforts to supplant the pseudo-classical school of literature, in favor of the romantic style, and to counteract the false French taste of that period, which, under Gustavus III., had been universally followed in Swedish literature and art. Palmblad successively occupied the chairs of history and geography and of Greek literature in the university of Upsala; and at his death in 1852 he left the character of having been of the most industrious and influential Swedish writers of his day. His principal works are—*Minnestafla ofner Sveriges Regenter* (1831); *Lärobok i nyare Historien* (Ups. 1832); *Handbok i physiska og politiska Geographien* (1837); *Lärobok i Geographien* (Orebro, 1847); *Grekisk Formkunskab* (Ups. 1845); and in addition to these purely instructive works, among his various novels we may instance his *Familjen Falkensvärd* (Oreb. 1844); *Aurora Köningsmark* (Oreb. 1846), which rank among the best of their class in Swedish literature. Palmblad was the editor of the great Swedish biography, *Namnkunnige Swenska Män* (Stock. 1835–52); and besides being an active coadjutor in the direction of the Swedish literary society, for which he wrote numerous papers, he was an active contributor to various German works of celebrity, as Ersch and Grüber's *Allgemeine Encyklopädie,* the *Conversations-Lexicon,* etc.

PALME, or PALMI, a royal city of South Italy, in the province of Calabrie, 21 m. n.e. of Reggio, on the coast of the bay of Gioja. The town, by means of its port, carries on an active trade. Pop. 11,100.

PALMELLA'CEÆ, a family or group of *Algæ*, of the order or sub-order *Confervaceæ*. In organization, they are among the lowest of plants; they are, however, universally regarded as vegetable, and do not, like the *Diatomaceæ*, occupy a somewhat doubtful position between the animal and vegetable kingdoms. The palmellaceæ all grow on damp surfaces, but some under the influence of fresh water, and some of salt. Some appear as a mere powdery layer, the granules of which have little adherence to each other, as red snow (q.v.); some of them assume the form of a slimy film or gelatinous mass, as gory dew (q.v.); and some are more firm and membranous, so as to have something of the character of a frond. The palmellaceæ bear so great a resemblance to the early stages of plants higher in organization, that doubts are entertained of their right to a distinct place in the botanical system, particularly as their mode of reproduction is not yet well understood. Conjugation has been observed in some of them.

PALMER (Lat. *palmifer*, a palm-bearer), the name of one of those numerous classes of PILGRIMS (q.v.), whose origin and history form one of the most interesting studies in in the social life of mediæval Europe. The Palmer, properly so called, was a pilgrim who *had performed* the pilgrimage to the HOLY SEPULCHER (see HOLY PLACES), and had returned, or was returning home after fulfilling his vow. The Palmers were so called from their carrying branches of the palm, in token of their accomplished expedition. On arriving at their home they repaired to the church to return thanks to God, and offered the palm to the priest, to be placed upon the altar. The palms so offered were frequently used in the procession of palm Sunday. Even after the time of his return, the religious character of the Palmer still continued; and although his office might be supposed to have ceased with the fulfillment of his vow, many Palmers continued their religious peregrinations even in their native country. They were thus a class of itinerant monks, without a fixed residence, professing voluntary poverty, observing celibacy, and visiting at stated times the most remarkable SANCTUARIES (q.v.) of the several countries of the west. Their costume was commonly the same as that of the ordinary PILGRIM (q.v.), although modified in different countries.

PALMER, a t. in Hampden co., Mass.; on the Chicopee river, and the Boston and Albany and the Central Vermont railroads; 15 m. e. of Springfield. It was incorporated in 1752, and contains several villages, public library, opera house, waterworks, electric light plant, national and savings banks, and manufactories of cotton and woolen goods, carpets, straw hats, and wire goods. Pop. '90, 6,520.

PALMER, ANTHONY, d. 1749; came from the West Indies to Pennsylvania in 1707. He was acting governor of that state 1747–48.

PALMER, CHRISTIAN VON, 1811–75; b. at Winnenden, near Stuttgart, Würtemberg; educated at Tübingen, attending the lectures of Steudel, Baur, and Schmidt; became dean of the Tübingen diocese and minister at Tübingen in 1851; in 1852 was appointed professor in the university, and lectured on liturgy, the history of ecclesiastical music, and New Testament exegesis. The same year he was ennobled by his sovereign. In 1869 he was elected vice-president of the synod, and in 1870, by the city of Tübingen, its representative in the diet. His theology was evangelical and favored progress. His works, which have been widely circulated, are: *Evangelische Homiletik; Evangelische Katechetik; Evangelische Pädagogik; Evangelische Pastoraltheologie; Die Moral des Christenthums; Evangelische Casualreden; Evangelische Hymnologie; Predigten aus neuerer Zeit.* He wrote several essays and articles for the *Jährbücher für Deutsche Theologie*, of which review he had been one of the editors from 1856, and for Herzog's *Real-Encyklopädie.*

PALMER, EDWARD HENRY, an English linguist, was born at Cambridge in 1840, and was educated at the university there, graduating in 1867. He accompanied the Sinai survey expedition of 1868–69; explored the land of Moab and other regions of the East in 1869–70, in behalf of the Palestine Exploration Society, and in 1871 became professor of Arabic at Cambridge, but resigned in 1881 to devote himself to journalism and general literature. In 1882 he was sent by the government among the Bedouin tribes east of the Red Sea, to prevent them from allying themselves with Arabi Pasha, and using disguise and his rare knowledge of languages, nearly succeeded in perfecting his plans when he was murdered by some thievish guides. He was a man of remarkable gifts and accomplishments, and acquired languages with phenomenal ease. Among his works are *The Negeb or South Country of Scripture* (1871); *The Desert of the Exodus* (1871); *A Persian-English and English-Persian Dictionary;* an *Arabic Grammar;* a translation of the Koran; and *The Survey of Western Palestine* (1878), which he edited with Walter Besant. He contributed to the *Encyclopædia Brittannica*, papers on "Hafiz," "Legerdemain," etc.; helped translate the poems of Runeberg, of Finland; and revised, with Dr. Bruce, Henry Martyn's Persian translation of the New Testament. His life, by Walter Besant (1883), is a most fascinating record.

PALMER, ERASTUS DOW, b. N. Y., 1817; early manifested a talent for carving, learned the trade of a joiner, removed to Albany and commenced cameo-cutting 1846, and in 1852 devoted himself to the art of sculpture, producing first an ideal bust of the infant "Ceres." Other works are: "An Indian Girl contemplating a Crucifix," "The White Captive," "The Sleeping Peri," and "The Landing of the Pilgrims," containing 16 statues, and intended for the capitol at Washington. His works in busts and bas-

reliefs number over 100, some of them illustrative of American history and social life, many of them interesting classical subjects—groups of allegorical and mythological figures carefully and poetically treated. He has produced portrait-busts of Erastus Corning, Com. M. C. Perry, Gov. E. D. Morgan, Alex. Hamilton, Washington Irving, etc. In 1873 he went to Paris and modeled a statue of Robert R. Livingston for the state of New York, cast in bronze in Paris, and placed in position in 1875 in the old hall of representatives at Washington.

PALMER, Innis Newton, b. Buffalo, N. Y., 1824; graduate of West Point, 1846; entered the mounted rifles; served in the Mexican war and on the frontier; brevetted 1st lieut. and brevetted capt. for bravery at Contreras, Churubusco, and Chapultepec; was wounded at the latter place. He was made 1st lieut., 1853; capt. 2d cavalry, Mar. 3, 1855. In the war of the rebellion he was appointed maj. 5th cavalry, Aug. 3, 1861; brig.gen. of vols. in the September following; transferred to North Carolina, Dec., 1862. He was promoted to lieut.col. 2d cavalry, Sept. 23, 1863. He was made brig.gen. of vols., Sept. 23, 1861; was in the peninsular campaign commanding a brigade in the 4th corps; commanded a division in the 4th corps in North Carolina; commanded defenses at New Berne, 1863–64; commanded the district of North Carolina, 1864–65. He participated in the movements of Gen. Sherman, was brevetted brig.gen., 1865. In June, 1868, he attained the rank of col., 2d cavalry, and served on the frontier; retired, 1879.

PALMER, James Shedden, 1810–67; b. N. J.; entered the U. S. navy as midshipman in 1825; made lieut. in 1836, and two years later served on the *Columbia* in the Sumatra battles of Quallah Battoo and Mushie. He also took part in the Mexican war, commanding the blockade schooner *Flirt*, and was promoted to the rank of commander, 1855. On the outbreak of the civil war he was in command of the *Iroquois*, then in the Mediterranean squadron, but was at once recalled and attached to Admiral Dupont's blockading fleet. In 1862 he was made a capt., and distinguished himself in the passage of the Vicksburg batteries and in the fight with the *Arkansas*, a confederate ram. He was Farragut's flag-capt. at Mobile and New Orleans, and displayed great personal gallantry and skill in handling his ship. He was appointed rear-admiral in 1866, and was in command of the North Atlantic squadron from 1865 till his death.

PALMER, John McCauley, b. Ky., 1817; received an ordinary education; removed to Illinois in 1832, and in 1840 was admitted to the bar. He was successful in practice, was prominent in political life, and in 1852 was elected state senator; was a delegate to the first republican national convention at Philadelphia in 1856, and to the peace convention at Washington, Feb., 1861. At the beginning of the civil war he was given command of the 11th Ill. vol., took part in Gen. Fremont's Springfield expedition, and soon afterwards was made brig.gen. He was present at the battles of New Madrid, Island No. 10, and Farmington, and at Stone River commanded the 1st brigade, 1st division, of the army of the Mississippi. In Nov., 1862, he was made a maj.gen., and in Sherman's campaign of 1864 in Georgia had command of the 14th corps. Later he was in command of the military department of Kentucky, resigning in 1866. In 1868 he was elected governor of Illinois by the republican party and served two terms. He took part in the "liberal republican" movement which resulted in the nomination of Horace Greeley at Cincinnati, and subsequently acted with the democratic party. His name was prominently mentioned in connection with the nomination for the presidency in 1880; in 1891 he was elected to the U. S. senate; and in 1896 he was the candidate of the national democratic (sound money) party for the presidency.

PALMER, Joseph, 1718–88; b. Mass.; represented his district in the provincial congress of Massachusetts, 1774–75; a member of the committee of safety. In the revolutionary war he was col. of a militia regiment on duty near the coast (1775–76, and served in the Rhode Island campaign, 1777, having attained the rank of brig. gen.

PALMER, Ray, D.D., b. R. I., 1808; graduated at Yale college in 1830; studied theology at New Haven; after teaching in New Haven became pastor of the Congregational church at Bath, Me., in 1835, and at Albany in 1850, and secretary of the American Congregational union, 1866–78. His home during his later years was at Newark, N. J. He published *How to Live, or Memoirs of Mrs. C. L. Watson; Doctrinal Text-Book; Spiritual Improvement; Hints on the Formation of Religious Opinions; Remember Me, or The Holy Communion; Hymns and Sacred Pieces; Reminiscences of Our Work for Fifteen Years; Home, or the Unlost Paradise; Hymns of My Holy Hours;* also many discourses and addresses, and papers in reviews. Of his hymns and sacred poems the best known and most widely used, though not equal to some others of his hymns, is "My Faith Looks up to Thee." A complete edition of his poetical works was published in 1880. He d. 1887.

PALMER, Roundell, Lord Selborne, D.C.L., b. Eng., 1812; educated at Rugby and Winchester schools, and at Oxford, where he gained the prize for Latin and for English verse. He was called to the bar in 1837, and soon attained a large practice in chancery. In 1849 he was made a queen's counsel, and elected a bencher of Lincoln's inn. In 1847 he was returned to parliament for Plymouth, where he acted as a liberal conservative, opposing the endowment of the Roman Catholic clergy, and favoring the extension of free trade. He was defeated in the election of 1852, was returned in 1853, and held his seat till 1857. In 1861 he became solicitor-general in lord Palmerston's

administration, and was soon afterward knighted, and made M.P. for Richmond. In 1863, on the death of sir William Atherton, he was appointed attorney-general. He went out of office with lord John Russell's second administration in 1866. When Mr. Gladstone formed a cabinet in 1868, sir Roundell Palmer was offered the chancellorship, but refused it on account of the divergence of his views on the Irish church question from those of the administration. He agreed with the cabinet as to the disestablishment of the Irish church, but disagreed with them on the question of the disendowment. He supported Mr. Gladstone's government, however, on most other public questions. In 1871 he acted as counsel of the British government before the arbitration commission at Geneva. The next year he succeeded lord Hatherly as lord chancellor, and was raised to the peerage as Baron Selborne, of Selborne, Hants. He went out of office in 1874, and returned in 1880. His attitude on the Irish land question was not entirely in accordance with that of other members of the Gladstone cabinet then in power. He was chosen lord rector of the university of St. Andrews in 1877. He edited in 1862 the *Book of Praise, from the best English Hymn Writers*, and published in 1878 *Notes on Some Passages in the Liturgical History of the Reformed English Church*. He made a critical and historical study of hymns. He died May 5, 1895.

PALMER, Samuel; 1805–81; b. London; d. Reigate, Eng. He studied art at the British museum and under various masters. He was elected a member of the Etching club, 1853, and of the Soc. of painters in water-colors, 1854. His pictures are distinguished for coloring and poetic charm. Among his works are, "The Ballad," 1860; "The Fall of the Empire," 1871; illustrations to "L'Allegro" and "Il Penseroso," 1877; and etchings illustrating Virgil's *Eclogues*, pub. 1883.

PALMERSTON, Viscount, Henry John Temple, an English politician, was born at the family mansion, Broadlands, near Romsey, Hants, Oct. 20, 1784. The Temples are of Saxon origin, and the family claim descent from Edwyn, who was deprived of the earldom of Mercia by the Conqueror, and lost his life in defending himself against the Normans in 1071. Sir W. Temple, the diplomatist and patron of Swift, was a member of this family, which removed to Ireland in the time of Elizabeth. The family was ennobled, 1722, when Henry Temple was created a peer of Ireland with the dignities of Baron Temple and Viscount Palmerston. His grandson, the second viscount, father of the famous peer, superintended his son's education at Broadlands, and then sent him to Harrow. Palmerston afterwards went to the university of Edinburgh, where he attended the prelections of Dugald Stewart and other professors. He next matriculated at St. John's college, Cambridge, whence he was summoned to attend the deathbed of his father, on whose decease, in 1805, Palmerston succeeded to the title. His eminent abilities were early recognized, for he was scarcely of age when the Tory party in the university selected him (1806) as their candidate to succeed Mr. Pitt in the representation. The late marquis of Lansdowne was the Whig candidate; and lord Byron, then at Cambridge, in his *Hours of Idleness*, evinces the interest he took in the election. Palmerston was unsuccessful, and again in 1807. He entered parliament, however, in the same year for the borough of Newport, his colleague being Arthur Wellesley, then chief secretary of Ireland. In 1811, he exchanged Newport for the university of Cambridge, enjoyed the distinction of representing his *alma mater* for 20 years, and only lost his seat when he became a member of the Grey administration, and supported the reform bill. For the last two years of the unreformed parliament, he sat for the now extinct borough of Bletchingly. At the first election after the reform act he was returned for South Hampshire, but lost his seat at the general election of 1835. He immediately afterwards found a seat for the borough of Tiverton, which he promised never to leave as long as the electors would permit him to represent them. Having traced his representative, we now turn to his official career. Palmerston entered life as a member of the Tory party, and accepted the office of secretary at war in the duke of Portland's administration in 1809. This office he held during the successive governments of Mr. Perceval, the earl of Liverpool, Mr. Canning, lord Goderich, and the duke of Wellington—a period extending from 1809 to 1828. There was ample scope at the war-office for Palmerston's administrative talents and activity. The military system swarmed with abuses, and the labor thrown upon the secretary at war during the peninsular campaign was prodigious. In 1817, an attempt was made to assassinate Palmerston by an insane army-lieutenant, named Davis, who fired a pistol at him as he was entering the Horse guards, the bullet, however, only inflicting a slight wound. Palmerston early attached himself to the Canning section of the Liverpool administration, and he accepted a seat in the cabinet of Mr. Canning. His official connection with the Tory party ceased in 1828, when the "great duke" insisted on accepting Mr. Huskisson's resignation, which was followed by Palmerston's retirement. The duke's government was swept away in the reform flood of 1830; and Earl Grey, who became prime minister, offered the seals of the foreign office to Palmerston. The European horizon was so disturbed at this crisis that a great political authority declared that if an angel from heaven were in the foreign office, he could not preserve peace for three months. Palmerston falsified the prediction. Louis Philippe then filled the throne of France; and for the first time on record, England and France acted in concert, and without jealousy, under Palmerston's foreign ministry. He took a leading part in effecting the independence of Belgium, and in establishing the

thrones of Queen Isabella of Spain and Queen Maria of Portugal on a constitutional basis. In 1841 Palmerston went out of office with the Whigs on the question of free trade in corn; but on their return in 1846, he resumed the seals of the foreign office. His second foreign administration furnished various subjects of hostile party criticism, among which may be mentioned the civil war in Switzerland, the Spanish marriages, the European revolutions in 1848, the rupture of diplomatic relations between Spain and Great Britain, and, finally, the affair of Don Pacifico and the quarrel with Greece. A vote of censure on the foreign policy of the government was, in 1850, carried in the house of lords on the motion of lord Stanley (afterwards earl of Derby). A counter-resolution, approving the foreign policy of the government, was thereupon moved by Mr. Roebuck in the lower house. The debate lasted four nights. In a speech of five hours' duration—"that speech," said sir Robert Peel, "which made us all so proud of him"—Palmerston entered upon a manly and dignified vindication of his foreign policy; and Mr. Roebuck's motion was carried by a majority of 46. In December, 1851, the public were startled at the news that Palmerston was no longer a member of the Russell cabinet. He had expressed his approbation of the *coup d'état* of Louis Napoleon, without consulting either the premier or the queen; and, as explanations were refused, her majesty exercised her right of dismissing her minister. Palmerston avenged himself, as soon as parliament met, by shattering the Russell administration to pieces on a comparatively trifling question regarding the militia. He refused an offer from the earl of Derby to join the government which he was commissioned to form, but accepted the post of home secretary in the coalition administration of the earl of Aberdeen in 1852. The fall of this government, on Mr. Roebuck's motion for a Sebastopol committee, placed Palmerston in his 71st year in the position of prime minister, to which he was unanimously called by the voice of the nation. He vigorously prosecuted the Russian war until Sebastopol was taken, and peace was made. His government was defeated in March, 1857, on Mr. Cobden's motion, condemnatory of the Chinese war. Parliament was dissolved, and Palmerston met the house of commons with a large majority. But his administration fell in Feb., 1858, upon the conspiracy bill, intended to protect the French emperor against the machinations of plotting refugees. A short conservative administration followed; but in June, 1859, Palmerston was again called to the post of first lord of the treasury, which he continued to fill up to his death. It was his ambition to be considered the minister of a nation rather than the minister of a political party; and his opponents have been constrained to admit that he held office with more general acceptance than any English minister since the time of the great lord Chatham. As an orator, he was usually homely and unpretending, but always sensible and practical. He was a dexterous tactician, and a ready, witty, and often brilliant debater. He was popular as a minister, because he was thoroughly English in his ends and aims. Even his robust health, manly bearing, and physical vigor were elements of his popularity, because they were regarded as a glorification of the English sports, which he was never ashamed to patronize. He desired nothing so ardently as to promote the wealth and grandeur of Great Britain, and his national character and national spirit were thoroughly appreciated by his countrymen. He married, in 1839, the widow of the fifth earl of Cowper, daughter of the first Viscount Melbourne. As he died without issue, and his only brother died unmarried, the title became extinct on Palmerston's decease, Oct. 18, 1865. See *Life of Palmerston* by sir Henry Lytton Bulwer (Lord Dalling), continued by Evelyn Ashley.

PALMER-WORM, a name given to many large kinds of grub, the larvæ of coleopterous insects, destructive to vegetable substances of various kinds. It is used in the English version of the Old Testament as the translation of the Hebrew *gazam*, rendered *kampe* by the Septuagint, which modern Hebrew writers and others very generally regard as a kind of locust, although more probably it is either the grub of a coleopterous or the caterpillar of a lepidopterous insect.

PALMET'TO, *Sabal palmetto* or *Chamærops palmetto*, a species of palm, a native of maritime parts of North America, as far n. as lat. 35°, which is further n. than any other American species of palm is found. It attains a height of 40 to 50 ft., and has a crown of large palmated leaves, the blade from one foot to 5 ft. in length and breadth, and the footstalk long. The flowers are small, greenish, and in long racemes; the fruit black, about as long as a pea-pod, and uneatable. The leaves are made into hats, mats, etc., and are also largely used for thatch. The terminal bud or *cabbage* is eaten. The wood is extremely porous; but is preferred to every other kind of wood in North America for wharves, as it is very durable, and not liable to be attacked by worms.—The *chamærops* (q. v.) *humilis* of the s. of Europe is also called palmetto.

PALMETTO STATE. See STATES, POPULAR NAMES OF.

PALMIERI, LUIGI, meteorologist, 1807–96; b. in Italy. From 1828 he held professorships of mathematics and physics in Salerno, Campobasso and Avellino, until in 1845 he became professor of physics in the naval school at Naples, and in 1847 at the university. After 1854 he was director of the meteorological observatory upon Mt. Vesuvius, and his observations there were embodied in his *Annali dell' osservatorio Vesuviano*. Immediately after the eruption of 1872 he published *Il Vesuvio et la sua Storia*.

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PALMS, ETC.—1. Pandanus litoralis. 2. Phytelephas macrocarpa. 3. Chamædorea Shiedea
7. Corypha umbraculifera. 8. Mauritia vinifera. 9. Borassus flabelliformis. 10. C
cut. 13. Fruit of the Metroxylon Rumphii. 14. Fruit of the Borassus flabelliformis.

4. Metroxylon Rumphii. 5. Cocoanut palm (Cocos nucifera). 6. Elaeis melanococca. ernicia cerifera. 11. Calamus equestris. 12 *a*. Fruit of the Areca triandra; *b*. the same, 5. Fruit of the Pandanus litoralis. 16. Fruit of the Phytelephas Ruizii.

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PALMIPE'DES, or WEB-FOOTED BIRDS, also called NATATORES, or SWIMMERS, an order of birds, the *anseres* of Linnæus, very natural and universally recognized by ornithologists, having the feet specially formed for swimming, and the toes *webbed*, i.e., connected by a membrane, at least those which are directed forwards. In swimming, the feet are contracted when drawn forwards, the toes being brought together, and expanded to their utmost extent in the backward stroke. In accordance with their aquatic habits, the palmipedes are further characterized by a boat-like form, calculated to move through the water with little resistance; and by a dense and polished plumage, oiled by a secretion from certain glands near the tail, very impervious to water; whilst warmth is further secured by a clothing of down, more or less abundant, beneath the feathers. They are remarkable for the length of the breast-bone (*sternum*), and the neck is often longer than the legs, a thing very unusual in birds, so that they can plunge the head far down in search of food. The length of the wings differs very much in different sections of the order, and with it the power of flying; as does also the power of diving, which some possess in a high degree, and others, even of the same family, in a very inferior degree. To this order belong geese, swans, ducks, divers, auks, guillemots, puffins, penguins, petrels, albatrosses, gulls, terns, shearwaters, noddies, pelicans, cormorants, frigate-birds, gannets, darters, tropic-birds, etc.

PALMISTRY. See CHIROMANCY.

PALMIT'IC ACID, $C_{16}H_{32}O_2$, is one of the most important of the *fatty acids*, represented by the general formula, $C_nH_{2n}O_2$ (see OILS AND FATS). In a pure state, when crystallized from alcohol, it occurs in the form of beautifully white acicular crystals arranged in tuft-like groups. These crystals are devoid of odor or taste, communicate a fatty feeling to the finger, fuse at 143.6° F. (62°C.), and solidify on cooling in the form of crystalline scales. This acid is lighter than water, in which it is perfectly insoluble; but it dissolves freely in boiling alcohol and in ether, and the solutions have a distinctly acid reaction. In small quantities it may be distilled without decomposing, if the heat be carefully regulated. The neutral palmitates of the alkalies constitute soaps, and are soluble in water; if, however, their solutions are largely diluted with additional water, they are decomposed, an insoluble acid salt being precipitated, while a portion of the base remains in solution. The addition of chloride of sodium (common salt) to a solution of an alkaline palmitate produces a similar effect. The other most important compounds of palmitic acid are those which it forms with glycerine and with cetylic alcohol. With glycerine this acid forms three compounds, viz., a triglyceride or tripalmitate (constituting the ordinary PALMITINE of chemists), a diglyceride, and a monoglyceride. In addition to its existence in the form of palmitine, palmitic acid is found in a free state in old palm-oil. In combination with cetylic alcohol, or cetyl hydrate, whose composition is represented by the formula $C_{16}H_{33}OH$, it is the main constituent of spermaceti (q.v.), which is in fact essentially a palmitate of cetyl, $C_{16}H_{33}\cdot C_{16}H_{31}O_2$; and as a palmitate of melissyl—a substance which will be noticed in the article WAX—it is the chief ingredient of bees-wax.

PALMITINE is a white fat, usually occurring, when crystallized from ether, in the form of a mass of small scaly crystals. According to Duffy, it occurs like the allied fat stearine in three modifications, each of which has a different melting-point—viz., 114.8°, 143°, and 145° F. On cooling, it solidifies into a wax-like mass, of lower specific gravity than water, and insoluble in that fluid, but readily soluble in ether and in boiling alcohol. It is a constituent of almost every kind of fat, and is the preponderating ingredient in those of a semi-solid consistence, and in many oils. It receives its name from the abundance in which it occurs in palm oil, and it may readily be obtained from this source by removing the liquid portion (the oleine) by pressure, and purifying the remaining palmitine by crystallization from ether, or a mixture of ether and alcohol. It has been stated in the article on glycerine (q.v.) that the composition of that substance may be represented by the formula $C_3H_5(OH)_3$. When palmitic acid unites with it to form a triglyceride (or the substance usually recognized as palmitine), three molecules of the acid unite with one of glycerine, setting free three molecules of water, and the resulting compound, glycerine tripalmitate, or palmitine, is consequently represented by the formula $C_3H_5(C_{16}H_{31}O_2)_3$.

PALM OIL. See OIL PALM.

PALMS, *Palmæ* or *Palmaceæ*, a natural order of endogenous plants, not excelled in importance by any order in the vegetable kingdom except grasses. They are generally tall and slender trees, often of gigantic height, without a branch, and bearing at the summit a magnificent and graceful crown of very large leaves. The stem is sometimes, however, of humble growth, and more rarely it is thick in proportion to its height; sometimes, but rarely, it is branched, as in the doom (q.v.) palm; and sometimes, as in rattans (q.v.), it is flexible, and seeks support from trees and bushes, over which it climbs in jungles and dense forests, clinging to them by means of hooked spines. Some of the species with flexible stem attain a prodigious length, ascending to the tops of the highest trees, and falling down again. Rumphius asserts that they are sometimes 1200, or even 1800 ft. long. Whatever the form or magnitude of the stem of a palm, it is always woody, and the root is always fibrous. It is only towards its circumference, however, that the stem is hard, and there in many species it is extremely hard; but the center is soft, often containing, when young, a great quantity of starch (sago), and sometimes

filled, when old, with a mass of fibers which can be separated without difficulty. Concerning the structure of the stem, see ENDOGENOUS PLANTS. The stem is generall marked externally with rings or scars, where former leaves have been attached; sometimes it is rough with the remaining bases of the leaves, and part of it is sometimes covered with their fibrous appendages. No other plants have leaves so large as many of the palms; the largest of all are those of some of the fan-leaved palms, but there are palms with pinnate leaves 50 ft. long and 8 ft. broad, and undivided leaves are to be seen 30 ft. long by 4 or 5 ft. broad. There are, however, also small palms, and palms with flexible stems, which have small leaves. The number of the large leaves which form the crown of even the most magnificent palm is never great. Whatever the size or form of the leaves, they are always stalked, the stalk being often in dimensions equal to a large bough of a great oak or other such tree. The leaves are commonly pinnated, the number of pinnules or leaflets being often very great; but about one-sixth of the whole number of known species of palms have fan-shaped leaves, and a few species have undivided leaves. The leaves are in all cases persistent, only falling off in succession as the palm advances in growth, and new ones are formed at the summit. The flowers are sometimes hermaphrodite, sometimes unisexual; the same tree having sometimes male, female, and hermaphrodite flowers, whilst other species are monœcious and others dicœcious. The perianth has six divisions, three outer and three inner; there are generally six, rarely three stamens; the ovary is composed of three carpels, distinct or united, each with one cell containing one ovule. The flowers are small, but are often produced in dense masses of very striking appearance. Humboldt reckons the number of flowers on a single palm (*Alfonsia amygdalina*) as about 600,000, and every bunch of the Seje palm of the Orinoco consists of about 8,000 fruits. The flowers are produced on scaly spadices, often much branched, and inclosed, before expanding, in leathery or woody spathes, often very large, and sometimes opening by bursting with a loud explosion. The flowers of some palms emit a very powerful odor, which attracts multitudes of insects. The fruit is sometimes a kind of berry, sometimes a drupe, either with a fleshy or fibrous covering; and sometimes contains a very hard and bony nut. The fruit is sometimes only of the size of a pea or a cherry; sometimes, notwithstanding the smallness of the flowers, it is of very large size, of which the cocoa-nut is a familiar example.

Palms are mostly natives of tropical countries, being found almost everywhere within the tropics, and forming, perhaps, the most striking characteristic of tropical vegetation. The tropical parts of America, however, particularly abound in them, producing a far greater number of species than any other part of the world. A few species are found in temperate regions; one species only, *chamærops humilis*, being a native of Europe, and extending as far n. as lat. 44°, whilst the northern limit of palms in Asia is about lat. 34°, and in North America, lat. 35°. In South America, the southern limit of palms is lat. 36°; in Australia, it is lat. 35°; in Africa, no native species is found further s. than lat. 30°; but in New Zealand, one species extends as far s. as lat. 38° 22′. Some of the species, however, which are found in tropical America grow in mountain regions bordering upon the limits of perpetual snow. Some palms have very narrow geographical limits; the cocoa-nut palm is by far the most extensively distributed species. Some, like the cocoa-nut, grow in maritime, others in inland districts. Some grow on dry and sandy ground, others in the richest alluvial soil, and some in swampy situations; some in open districts, others in dense forests. Some species are generally found singly, some in groups; some even cover tracts of country in which no other tree appears.

The uses of palm are many and various; there is almost no species which is not capable of being applied to some use. Tribes in the lowest grade of civilization depend almost entirely on particular species of palm, as the cocoa-nut palm, for the supply of all their wants. The fruit of some species is eaten; sometimes the fleshy part of the fruit, sometimes the kernel of the nut. The importance of the date and the cocoa-nut needs only to be alluded to; but in this respect they far excel the fruits of all other palms. A grateful beverage is made from the fruit of some palms (see ASSAI), consisting simply of a mixture of the pulp with water; but a kind of wine can be obtained also by fermentation (see DATE PALM). A beverage more generally used is the sap of palm-trees, either fresh or fermented (*palm-wine* or *toddy*), from which also a kind of spirits called arrack (q.v.) is obtained by distillation; whilst from the fresh sap, boiled down, sugar is obtained—the *jaggery* of the East Indies. The sap of various species of palm is collected and used for these purposes, and that of many others is probably not less suitable. The pulp of the fruit of some species, and the kernel of others, yield bland, fixed oil, useful for various purposes. See OIL PALM and COCOA-NUT. The soft and starchy center of the stem of some palm affords a very important and abundant article of food. See SAGO. The terminal bud, or *cabbage*, of some species is boiled for the table; and although the taking of the bud is death to the tree, this is little regarded where vegetation goes on with a rapidity and luxuriance unknown in the colder parts of the world. The young sprouts arising from the seeds of palm, when they have begun to vegetate, are another esculent of tropical countries. From the stems of some species of palm, as the wax palm (q.v.) of the Andes, and from the leaves of some, as the Carnahuba palm (q.v.), wax is obtained, which is used for the same purposes as beeswax. The wood of palm is used in house-building, and for many other purposes; some affording very hard and beautiful wood for ornamental work, whilst others are suitable only

for coarse purposes. The great leaf-stalks are also used for some of the purposes of timber. The stems of the most slender species are used for walking-sticks, etc., and, split or unsplit, for wicker-work. See RATTAN. The leaves of many palms are used for thatching houses. The spathes of some species are used as vessels or bags. The fibers of the leaf, the fibers connected with the leaf-stalk, the fibers of the rind of the fruit, and the fibers of the stem of different kinds of palm are used for making cordage, mats, nets, cloth, etc. The most important of these fibers are Coir (q.v.), or cocoa-nut fiber, Gomuto (q.v.), or Ejoo fiber, and piassaba (q.v.). The coarsest fibers are employed as bristles for making brushes, etc. Stripes of the delicate epidermis of the young unopened leaves of some South American palm are twisted, and so used for making a kind of thread; hammocks made of which are highly valued. See ASTROCARYUM. The leaves of the Palmyra palm and Talipot palm are used in some parts of the e. for writing upon, an iron style being employed instead of a pen. One of the kinds of the resinous substance called *Dragon's Blood* is obtained from the fruit of a palm. The Betel (q.v.) nut, abounding in catechu, is the fruit of a palm. The fruit of many palms is very acrid. The ashes of the fruits of some American species are used by the Indians as a substitute for salt, probably on account of potash, or some salt of potash, which they contain; and much potash may be obtained from the stems and leaves of palms. Vegetable ivory (see IVORY, VEGETABLE) is the kernel of the fruit of a palm; and somewhat similar to it in quality is the coquilla-nut (q.v.). But a complete enumeration of the uses to which Palm and their products are applied is almost impossible.

Some of the more important species of palm are noticed in separate articles.

About 500 species are known; but it is probable that many are still undescribed. The most complete work on palm is the monograph by Martius, *Genera et Species Palmarum* (3 vols. large folio, Munich, 1823–45), a magnificent work, with 219 colored plates; but many new species have been discovered since its publication.

The cultivation of palms in hot-houses is attended with great expense. Separate houses are devoted to them in a few gardens, of which the greatest is that at Kew. A very fine palm-house has been erected in the botanic garden of Edinburgh. Palms are cultivated in hot-houses merely as objects of interest, and for the gratification of a refined taste, never for the sake of their fruit or any other product.

PALM SUNDAY (Lat. *Dominica Palmarum*, or *Dom. in Palmis*), the last Sunday of Lent, is so called from the custom of blessing branches of the palm tree, or of other trees substituted in those countries in which palm cannot be procured, and of carrying the blessed branches in procession, in commemoration of the triumphal entry of our Lord into Jerusalem (John xii.). The date of the origin of this custom is uncertain. The first writer in the west who expressly refers to it is Venerable Bede. The usage certainly existed in the 7th century. A special service is found in the Roman missal, and also in the Greek euchologies, for the blessing of "branches of palms and olives;" but in many countries, other trees, as in England, the yew or the willow, and in Brittany, the box, are blessed instead. A procession is formed, the members of which issue from the church carrying branches in their hands, and singing a hymn suited to the occasion, of very ancient origin. In the Greek church, the book of the gospels is borne in front. In some of the Catholic countries of the west, a priest, or, occasionally a lay figure, was led at the head, mounted upon an ass, in commemoration of our Lord's entry into the city—a usage which still exists in Spain and in Spanish America. Before their return to the church, the doors have been closed, and certain strophes of the hymn are sung alternately by a choir within the church, and by the procession without, when, on the sub-deacon's knocking at the door, it is again thrown open, and the procession re-enters. During the singing of the passion in the solemn mass which ensues, the congregation hold the palm branch in their hands, and at the conclusion of the service it is carried home to their respective houses, where it it preserved during the year. At Rome, the procession of the palms, in which the pope is carried, is among the most striking of the picturesque ceremonies of the holy week. In England, Palm Sunday anciently was celebrated with much ceremonial; but the blessing and procession of the palms was discontinued in the Church of England, together with the other ceremonies abolished in the reign of Edward VI.

PALM-WINE, a beverage made of the juice which flows from the wounded spathes of the cocoa-nut tree, and some other species of the palm, in India, where it is called *toddy*. It is obtained also from the oil-palm. Palm-wine is extensively used in India and Chili, and is almost the only fermented liquor made in Africa.

PALMY'RA, the name given by the Greeks to a great and splendid city of upper Syria. Its original Hebrew name was *Tadmor*, which, like the Greek word, means "city of palms." It was built according to the writers of Kings (Book I. chap. ix. verse 18) and Chronicles (Book II. chapter viii. verse 4), by Solomon in the 10th c. B.C.; but it is more probable that he only enlarged it. It occupied a fertile oasis, well watered, and abounding in palm trees. Barren and naked mountains overlook it from the w., and to the e and s. stretches the illimitable sandy desert. Palmyra was, in the Solomonic age, a bulwark of the Hebrew kingdom against the wandering hordes of Bedouins; but its early history is obscure and insignificant. After the fall of Selucia, it became a great center of commercial intercourse between the e. and the w. of Asia. Its commercial

importance, wealth and magnificence greatly increased after the time of Trajan, who subjected the whole country to the Roman empire. In the 3d c., Odenathus, a Syrian, founded here an empire, which, after his murder, rose to great prosperity under his wife, Zenobia (q.v.), and included both Syria and Mesopotamia; but this was not of long duration, for the Roman emperor Aurelian conquered it in the year 275, and the city was soon after almost entirely destroyed in revenge for the slaughter of a Roman garrison. It never recovered from this blow, although Justinian fortified it anew. The Saracens destroyed it in 744. A village called Tedmor, inhabited by a few Arab families, now occupies the site. The ruins of the ancient city, white and dazzling in the Syrian sun, excite, at a little distance, the admiration of all beholders; but when examined in detail, they are said to be far from imposing, though in regard to this latter point opinions differ. They were visited by English merchants resident at Aleppo in 1691, and again by Messrs. Wood and Dawkins in 1751, and since then by a vast number of travelers. The ruins of a temple of Baal, the sun god, are, however, confessedly magnificent. The language of ancient Palmyrene appears, from inscriptions which remain, to have been an Aramaic language. See Murray's or Baedeker's *Handbook for Syria and Palestine;* Vogüé's *Syrie Centrale.*

PALMYRA, city and co. seat of Marion co., Mo.; on the Burlington Route railroad; 16 miles s.w. of Quincy, Ill. It contains Centenary college, high school, opera house, electric light plant, waterworks supplied from springs and the North river, national and state banks, about 10 churches, flour mills, and wagon factories, and has weekly newspapers, and agricultural and hard lumber interests. Pop. '90, 2,515.

PALMYRA PALM, *Borassus flabelliformis,* a species of palm with a magnificent crown of fan-shaped leaves, a native of the East Indies. The stem attains a height of 25–40, or even 60 ft., and tapers slightly upward. The leaves are about four feet long, with stalks of about the same length, the stalks spiny at the edges; each leaf having 70–80 rays. The fruit is somewhat triangular, about the size of a child's head; having a thick, fibrous, and rather succulent yellowish-brown or glossy black rind, and containing three seeds each as large as a goose's egg. The Palmyra palm is the most common palm of India, growing spontaneously in many districts, cultivated in others, and reaching as far n. as lat. 30°. It is of slow growth; and the wood near the circumference of the stem in old trees is very hard, black, heavy, durable, susceptible of a high polish, and valuable, easily divided in a longitudinal direction, but very difficult to cut across. The Palmyra palm abounds greatly in the n. of Ceylon, forming extensive forests; and the timber is exported to the opposite coast of India, being of superior quality to that which is produced there. It is much used in house building. The stalks of the leaves are used for making fences, etc. The leaves are used for thatching houses; for making baskets, mats, hats, umbrellas, and large fans; and for writing upon. Their fibers are employed for making twine and small rope; they are about two feet long, and very wiry. A fine down found at the base of the leaf stalks is used for straining liquids, and for stanching wounds. The Palmyra palm yields palm-wine, and of course also arrack and sugar (*jaggery*). It furnishes great part of the palm-wine, sugar, and arrack of India. See ARRACK. The fruit is cooked in a great variety of ways, and used for food. The seeds are jelly-like, and palatable when young. A bland fixed oil is extracted from the fruit. The young plants, when a few inches high, are esteemed as a culinary vegetable, being boiled and eaten generally with a little of the kernel of the cocoa-nut; and sometimes they are dried and pounded into a kind of meal. Multitudes of the inhabitants of the n. of Ceylon depend almost entirely on the Palmyra palm for the supply of all their wants. In the "Palmyra regions" of the southern Dekkan vast numbers of the people subsist chiefly on the fruit of this palm.

The Deleb palm (q.v.), so important to the inhabitants of central Africa, is believed to be nearly allied to the Palmyra palm. See illus., PALMS, ETC.

PALMYRA WOOD. Properly this name applies only to the wood of the Palmyra palm (*Borassus flabelliformis*), but it is generally used for all kinds of palm-tree wood imported into this country, amongst which very much is the wood of the cocoa-nut palm (*cocos nucifera*), and the allied species *C. plumosa.* These woods are also called *speckled wood* and *porcupine wood* by the dealers—the former name being applied to those veneers cut transversely, and showing the ends of numerous black fibers mixed with the lighter colored portions; and the latter to longitudinal sections, in which the mixed black and white fibers much resemble porcupines' quills.

PALO ALTO, a co. in n. Iowa; drained by a branch of the Des Moines river, and containing several small lakes; 576 sq.m.; pop. '90, 9318, chiefly of American birth. The surface is mostly prairie and the soil very rich; oats, wheat, and hay, are the chief products. Co. seat, Emmetsburg.

PALO ALTO, BATTLE OF, in s. Texas, between Point Isabel and Matamoras, about 9 m. from the latter place. On May 8, 1846, the Americans, numbering 2300, under Gen. Taylor, defeated 6000 Mexicans under Gen. Arista; American loss, 4 killed, 40 wounded; Mexican loss, 100 killed. On May 1st Gen. Taylor set out on the march from Fort Brown, near Matamoras, leaving Maj. Brown, 7th inf., in charge, to Point Isabel, to save some stores which were in danger of being taken by the Mexicans. He arrived safely, and having attended to the commissaries, started back to relieve Maj. Brown

whom he was advised had been attacked at Fort Texas. The enemy made an attempt to cut him off from Fort Brown. The engagement commenced with an artillery fire and a cavalry charge from the Mexicans, which was met and forced back by the Americans, who steadily advanced and caused the retreat of the Mexicans after 5 hours' fighting.

PALO BLANCO, *Flotovia dicanthoides,* a large tree, a native of Chili, the wood of which is white, and very useful and durable. It is remarkable as one of the few large trees belonging to the natural order *Compositæ.*

PALO'LO, or BALOLO, *Palolo viridis,* a dorsi-branchiate annelid, allied to the lug-worm, extremely abundant at certain seasons in the sea above and near the coral reefs which surround many of the South Sea islands, as the Samoa islands and the Fiji islands. The body is cylindrical, slightly tapering at both ends, divided into nearly equal joints, each joint with a small tuft of gills on each side. In thickness, the palolo resembles a very fine straw; it is about three inches long, generally of a greenish color, with a row of round black spots; but the color varies to red, brown, and white. These annelids make their appearance in great multitudes, apparently rising out of the coral reefs, and with a periodical regularity which is very remarkable. They are eagerly sought after by the islanders, who are on the watch for their appearance, and go out in canoes early in the morning to take them by means of nets; but they often occur in such numbers that the water seems to be full of them, and they may be grasped by handfuls. They are a delicacy of which the South Sea islanders are very fond. To prepare them for use, they are wrapped in bread-fruit leaves, and cooked for twelve or eighteen hours in an oven.

PALO PINTO, a co. in n.w. Texas, drained by the Brazos and Palo Pinto rivers; 960 sq.m.; pop. '90, 8320, chiefly of American birth. The surface is in part woodland and in part prairie, and well adapted for cattle raising, which is the main industry. Predatory bands af Indians are found. Co. seat, Palo Pinto.

PALOS, a t. in the province of Huelva, Spain, on the Rio Tinto, near the Atlantic; pop. about 2000. Columbus sailed from the bay of Palos, on his first voyage, Aug. 3, 1492, and returned to it Mar. 15, 1493, after the discovery of America. Near by is the convent where he asked for alms, and the prior of which, Juan Perez de Marchena, used his influence at court to further the undertaking of the voyage.

PAL'PI (from the Lat. *palpo,* I touch) are organs occurring in insects, crustaceans, and arachnidans. In insects, one or two pair of jointed appendages bearing this name are attached to the maxillæ, while one pair is attached to the labium; and in the higher crustaceans, similar appendages are attached to the mandibles and foot-jaws. In both these classes, the palpi probably serve, through the sense of touch, to take cognizance of the qualities of the substances which are employed as food. In the arachnidans, the palpi are attached to the maxillæ only; and vary exceedingly in form and functions. In the scorpions, for instance, they are extremely developed, and terminate in pincers which resemble the chelæ (or pincers) of crabs and lobsters; while in the spiders, they terminate in a single movable claw in the female, and in the male the last joint is dilated, and acts as an accessory generative organ.

PALPITATION is the term used to signify inordinately forcible pulsations of the heart, so as to make themselves felt, and frequently to give rise to a most troublesome and disagreeable sensation. It may be either functional or a symptom of organic disease of the heart. Here we shall merely consider it as a functional disorder. Although it may be persistent, it far more frequently comes on in paroxysms, which usually terminate within half an hour, recurring afterward quite irregularly, sometimes daily or several times a day, and sometimes not till after a long interval. The attack often comes on under some mental or physical excitement, but sometimes when the patient is quite composed, or even asleep. If the paroxysm is a severe one, the heart feels as if bounding upward into the throat; and there is a sensation of oppression over the cardiac region, with hurried or even difficult respiration. Excluding organic diseases, the causes of this affection are either (1) an abnormally excitable condition of the nerves of the heart, or (2) an unhealthy condition of the blood.

1. Amongst the causes of disturbed innervation may be especially noticed the abuse of tea (especially green tea), coffee, spirits, and tobacco. Any irritation of the stomach and intestinal canal may be reflected to the heart; and hence palpitation may frequently be traced to flatulence, undue acidity, and intestinal worms, especially tape-worms. Everything that causes pressure on the heart, such as tight-lacing, abdominal dropsy, or an enlarged uterus, is also liable to occasion this affection.

2. If the blood is abnormally rich and stimulating it may give rise to palpitation, as in plethora (q.v.); but the opposite condition, known as anæmia (q.v.), is a much more common cause of this affection. In anæmia the blood is watery and deficient in fibrine, and (far more) in red corpuscles; and being thus in an unnatural state, it acts as an unnatural stimulant, and induces frequent, although not usually strong pulsations. In cases of this kind, singular murmurs (not unlike those which are heard when we apply certain shells to the ear) are heard on applying the stethoscope to the neck over the course of the great jugular veins.

The age at which palpitation most usually comes on is from 15 to 25 years; and the

affection—especially if it arise from anæmia—is very much more common in the female than in the male sex.

The treatment of palpitation must entirely depend upon its cause. The use of all nervous stimulants (tea, coffee, alcohol, and tobacco) should be suspended or abandoned. If the patient is clearly plethoric, with a full strong pulse, he should take saline cathartics, and live upon comparatively low diet (including little animal food) until this condition is removed. When, on the other hand, the palpitation is due to an anæmic condition, the remedies are preparations of iron, aloetic purgatives, an abundance of animal food, bitter ale, the cold shower bath, and exercise, short of producing positive fatigue, in a pure bracing air. In the paroxysms, relief will often be afforded by the administration of a diffusible stimulant, such as ammoniated tincture of valerian, aromatic spirit of ammonia, etc.

PALSY. See PARALYSIS.

PALY. See PALE.

PAMIERS, a t. of France, department of Ariège, capital of the arrondissement of Pamiers on the right bank of the Ariège, 34 m. s.e. of Toulouse; pop. '91, 9537. It is in a beautiful district, rich in corn, fruit, and pasturage. It contains a cathedral, surmounted by an ancient gothic brick tower, several other churches, a convent, bishop's palace, a college, seminary for the education of the clergy, several schools, a court-house, and a large hospital. It has manufactures of hardware and woolens, paper, flour and saw-mills, and a thriving trade in corn. There is a chalybeate spring in the neighborhood.

PAMIR. See TURKISTAN.

PAMLICO, a co. in e. North Carolina, bordering on Pamlico sound; drained by the Neuse; about 460 sq.m.; pop. '90, 7146 of American birth, with colored. The surface is swampy and covered with forests of cypress, pine, and other trees. Indian corn and pork are the chief products. Co. seat, Bayboro.

PAMLICO SOUND, a large bay on the coast of North Carolina, separated from the ocean by long, narrow islands of sand, an angle of the largest forming cape Hatteras, and connected with the ocean by narrow passages, the chief of which is Ocracoke inlet, and on the n. with Albemarle sound; it is 80 m. long, and from 10 to 30 m. wide, and receives the Neuse and Pamlico rivers.

PAM'PAS (in the Quichua tongue, a "valley" or "plain"), is a term employed in a general sense as a designation of southern American plains, in contradistinction to the "prairies" of North America, and in this sense it is frequently employed by geographers. It is also used in Peru as a general designation of tracts of level land either on the coast or among the mountains, and in this sense occurs as a component of many proper names, being then transformed into *bamba.* The chief pampas in Peru are those of the Sacramento. But in its more special and proper signification, the word pampas is given to the immense and partly undulating plains bounded by the Rio Negro of Patagonia, the La Plata and Paraguay, and the base of the Cordilleras. These plains during the wet season afford abundant pastures to the many herds of wild oxen and horses which roam over them, but they become rapidly parched under the burning heat of the sun, except in the low-lying tracts, or along the banks of rivers. The most fertile of the pampas lie westwards towards the Cordilleras. From the rapid alternation of vigorous growth with parching drought, the growth of trees is impossible, and their place is accordingly supplied by sparse groups of stunted shrubs. The soil, which is in general poor, is a diluvium composed of sandy clay, and abounds in the bones of extinct mammals. Strips of waterless desert, known as *travesias,* stretch across the pampas, these travesias are destitute of all vegetation with the exception of a few bushes, and are markedly distinct in geological character. The soil of the pampas is more or less impregnated with salt, and saltpeter abounds in many places. The wild animals of the pampas are horses, oxen (both introduced by the Spaniards), nandous, and guanacos. The skins of the horses and oxen, and the flesh of the latter, form a most important item in the trade of this region. The half-white inhabitants of the pampas are called Guachos (q.v.). The whole area of the pampas has been estimated at about 1,500,000 sq.miles.

PAMPAS GRASS, *Gynerium argenteum,* a grass which covers the *pampas* in the s. of Brazil and more southern parts of South America, and has been introduced into Britain as an ornamental plant. It is quite hardy, and its tufts have a splendid appearance. The leaves are 6 or 8 ft. long, the ends hanging gracefully over; the flowering stems 10 to 14 ft. high; the panicles of flowers silvery white, and from 18 in. to 2 ft. long. The herbage is too coarse to be of any agricultural value. The male and female flowers are on separate plants; in panicles; the spikelets 2-flowered, one floret stalked, and the other sessile; the paleæ of the female florets elongated, awn-shaped, and woolly.—Another species of the same genus, *G. saccharoides,* also a Brazilian grass, yields a considerable quantity of sugar. See illus., GRAIN, ETC., vol. VI.

PAMPELU'NA, or PAMPLO'NA, a fortified city of Spain, capital of Navarre, of which it is the key, occupies an eminence not commanded by any neighboring height, on the left bank of the Arga, a tributary of the Ebro, 111 m. n.n.w. of Saragossa by railway and 50 m. s.w. of Bayonne. The citadel, overlooking the river and commanding the plain, is

a regular pentagon, each side being 1000 ft. in extent, and is connected with the city by an esplanade or glacis. Magnificent views of the Pyrenees on the n. are obtained from the citadel, and there are several very pleasant promenades. The *cuenca* (plain) of Pampeluna is about 30 m. in circumference; and although the climate is somewhat chilly and damp, the gardens are fruitful and the meadows verdant. The city is well built and clean; water is brought from hills about 9 m. distant, by means of an aqueduct built after the solid Roman style by Ventura Rodriguez, and a portion of which, 2,300 ft. in length, is supported on 97 arches, 35 ft. in span and 65 ft. in height. The town contains a number of squares with fountains, a theater, and the regular *plaza de toros*—bull arena—capable, it is said, of containing 10,000 people. Agriculture, the wine trade, and the manufacture of linens and leather are the only noteworthy branches of industry. Pop., before the ruinous Carlist blockade in 1874, about 26,700.

Pampeluna was called by the ancient *Pompeiopolis*, from the circumstance of its having been rebuilt by the sons of Pompey in 68 B.C. It was taken by the Goths in 466, by the Franks under Childebert in 542, and again under Charlemagne in 778. It was subsequently for a time in possession of the Moors, who corrupted the name Pompeiopolis into *Bambilonah*, whence the modern Pamplona. In later times it was seized by the French in 1808, and held by them till 1813, when it fell into the hands of the allies under the duke of Wellington.

PAM'PHILUS, b. at Amphipolis in the 4th c. **B.C.** and studied painting at Sicyon, under Eupompus, whom he succeeded as the head of the Sicyonian school. The characteristics of this school were a stricter attention to dramatic truth of composition, and also the acquisition of all sciences relating directly or indirectly to painting. The length of the course was extended over 10 years, and the art of delineation was made fundamental in the education of all who were free-born. This school was the most famous of all the schools of ancient painting. The fee of admission was a talent, or about £216. Among the pupils at this school were Apelles and Melanthius. We have an account of only four of the pictures of Pamphilus, "The Heraclidæ"; "The Battle of Phlius"; "Ulysses on the Raft," and "Cognatio, or Relationship."

PAM'PHILUS, a Christian writer said to have been b. at Berytus in the latter half of the 3d c.; studied under Pierius of Alexandria, and spent most of his life as a presbyter at Cesaræa in Palestine. He founded a theological school, and established a valuable ecclesiastical library, which became celebrated. He multiplied copies of the Scriptures, and supplied them to the poor. He welcomed any also to his library or his school. He was the author of an *Apology for Origen* in five books, continued by his pupil and admirer, Eusebius. He prepared, in conjunction with Eusebius, an edition of the *Septuagint* from the text in Origen's *Hexapla*, which was generally used in the eastern church. During the persecution of the Christians by Diocletian he suffered martyrdom in 309 for refusing to sacrifice to the gods.

PAMPHLET (variously derived from Spanish *papaleta*, slip of paper on which anything is written, and *pagina filata*, threaded page), a small book consisting of a sheet of paper, or a few sheets stitched together, but not bound. It generally contains a short treatise on some subject, political or otherwise, which is exciting public attention at the time of its appearance. The word is of considerable antiquity, as it is to be met with in Chaucer; but it was not till about the middle of the 16th c. that pamphlets began to be of common use in political and religious controversy in England and France. Under the second French empire, political pamphlets appeared from time to time which were generally believed to be written under imperial dictation, and either to speak the sentiments of the emperor, or to be feelers of public opinion.

PAMPHYLIA, anciently a country on the s. coast of Asia Minor, with Cilicia on the e. and Lycia on the w. It was originally bounded on the inland or northern side by mount Taurus, but afterward enlarged so as to reach the confines of Phrygia. Pamphylia is mountainous, was formerly well wooded, and had numerous maritime cities. The inhabitants—a mixed race of aborigines, Cilicians, and Greek colonists—spoke a language the basis of which was probably Greek, but which was disfigured and corrupted by the infusion of barbaric elements. Their coins show that they had adopted to some extent the religion, arts, and games of the Hellenic race. Its political history is unimportant. Along with Phrygia and Lycia it fell to the share of Antigonus on the partition of the Macedonian empire. It afterwards passed successively into the hands of the Græco-Syrian princes, the kings of Pergamus, and the Romans.

PAN, among the Greeks, the chief god of pastures, forests, and flocks. The later rationalizing mythologists, misconceiving the meaning of his name, which they confounded with *to pan*, "the whole," or "the universe," whereas it is more probably connected with *paō* (Lat. *pasco*), "to feed," "to pasture," represented him as a personification of the universe, but there is absolutely nothing in the myth to warrant such a notion. Pan, neither in his genius nor his history, figures as one of the great principal deities, and his worship became general only at a comparatively late period. He was, according to the most common belief, a son of Hermes (Mercury) by the daughter of Dryops; or by Penelope, the wife of Ulysses; while other accounts make Penelope the mother, but Ulysses himself the father—though the paternity of the god is also ascribed to the num-

erous wooers of Penelope in common. The original seat of his worship was the wild hilly and wooded solitudes of Arcadia, whence it gradually spread over the rest of Greece, but was not introduced into Athens until after the battle of Marathon. Homer does not mention him. From his very birth his appearance was peculiar. He came into the world with horns, a goat's beard, a crooked nose, pointed ears, a tail, and goat's feet; and so frightened his mother that she ran off for fear, but his father, Hermes, carried him to Olympus, where all the gods, especially Dionysus (Bacchus), were charmed with the little monster. When he grew up he had a grim shaggy aspect, and a terrible voice, which bursting abruptly on the ear of the traveler in solitary places—for Pan was fond of making a great noise—inspired him with a sudden fear (whence the word *panic*). It is even related that the alarm excited by his blowing upon a shell decided the victory of the gods over the Titans. He was the patron of all persons occupied in the care of cattle and of bees, in hunting and in fishing. During the heat of the day he used to take a nap in the deep woods or on the lonely hillsides, and was exceedingly wroth if his slumber was disturbed by the halloo of the hunters. He is also represented as fond of music, and of dancing with the forest nymphs, and as the inventor of the syrinx or shepherd's flute, also called Pan's pipe. Cows, goats, lambs, milk, honey, and new wine were offered to him. The fir-tree was sacred to him, and he had sanctuaries and temples in various parts of Arcadia, at Troezene, at Sicyon, at Athens, etc. The Romans identified the Greek Pan with their own Italian god Inuus, and sometimes also with Faunus. See FAUN.

When, after the establishment of Christianity, the heathen deities were degraded by the church into fallen angels, the characteristics of Pan were transferred to the devil himself, and thus the "auld hornie" of popular superstition is simply Pan in disguise.

PANA, a city in Christian co., Ill.; on the Illinois Central, the Baltimore and Ohio Southwestern, and the Cleveland, Cincinnati, Chicago, and St. Louis railroads; 95 miles n.e. of St. Louis. It contains four coal mines, the B. and O. S. W. railroad shops, Y. M. C. A. building with public library, electric light plant, banks, and public and parochial schools, and has several daily and weekly newspapers. Pop. '90, 5,077.

PANAMA', a city and free port of the republic of Colombia, in South America, capital of the "state" of the same name, at the head of the bay of Panama, on the southern shore of the isthmus of the same name, in lat. 8° 57′ n.; long. 79° 31′ west. It occupies a tongue of land which extends some distance out to sea in shallow waters. The harbor is safe, but vessels of more than 80 tons burden cannot approach within 2 m. of the shore. Large vessels anchor at a distance of 3 m., near the island of Perico. The important edifices of the city include a beautiful cathedral, a college, and several convents, all of which, however, are falling into decay. There is considerable trade with Europe in pearls, mother-of-pearl, shells, and gold-dust, obtained in the vicinity. Panama is chiefly important, however, as the Pacific terminus of the Panama railway. This railway was completed in 1855, is about 48 m. in length, and connects Panama on the Pacific with Aspinwall colony on the Atlantic. By means of it the route to California was much shortened, and mails were carried over it till the completion of the Pacific railway. Pop. 25,000. The former city of Panama, the seat of the Spanish colonial government, established in 1518, stood 4 m. e.n.e. of Panama, and is now a heap of ruins.

PANAMA CANAL. See INTEROCEANIC SHIP CANAL.

PANAMA, ISTHMUS OF, is that portion of the narrow ridge of mountainous country connecting Central and South America which is bounded on the w. by the frontier of Costa Rica, and on the e. by the surveyed interoceanic route from the bay of Caledonia on the n. to the gulf of San Miguel on the s. or Pacific side. It extends in long. from 77° to 83° west. The "state" of Panama, one of those which form the United States of Colombia, is co-extensive with the isthmus of the same name. Area, 29,756. Pop. '81, 285,000. Panama contains the provinces of Panama, Azuero, Chiriqui, and Veraguas. The isthmus is traversed throughout by a chain of mountains, forming the barrier between the Atlantic and Pacific oceans, and of which the highest peak is that of Picacho (7,200 ft.) in the west. Numerous streams, the largest of which is the Tuira (162 m. long, and navigable for 102 m.), fall into both oceans. On the Pacific shores are numerous beautiful islands, among which Las Perlas, so called from their pearl fisheries, and the island of Coiba, are the chief. On the n. coast the principal harbors are the Chiriqui lagoon, San Blas, and Caledonia; on the s. shore, Damas in the island of Coiba, the bay of San Miguel, and Golfo Dulce. Gold, which in ancient times was obtained here in great quantities, is still found, and mines of salt, copper, iron, coal, etc., are worked. The climate is unhealthy, except in the interior and on the flanks of the mountains. Almost all the plants of the torrid zone may be raised here, but maize, rice, plantains, etc. (grown for the purpose of supplying the transit), are the chief crops. The imports amount annually to about $2,500,000, and the exports to the same value. The latter consisted of cotton, india-rubber, cloth and grass hammocks, grass (Panama) hats, matting, etc. Commerce is the chief employment.

In 1855 a railway across the isthmus, from Aspinwall city on the Atlantic to Panama on the Pacific, was opened. The summit of the railway is 250 ft. above the level of the sea; and the average value of the goods that annually pass over it is estimated at $55,000,000. The isthmus has frequently been surveyed with the object of finding a

route for an interoceanic canal. The name isthmus of Panama is generally used as interchangeable with the isthmus of Darien (q.v.).

PAN-AMERICAN CONGRESS. See RECIPROCITY

PANATHENÆ'A, the most famous festival of Attica, celebrated at Athens in honor of Athene, patron goddess of the city, and intended to remind the people of Attica of their union into one community by the mythical Theseus. Before the time of Theseus, or—to speak more critically—before the formation of the Attic confederacy, this festival was only for the citizens of Athens, and was called simply *Athenæa.* According to tradition, the Athenæa owed its origin to king Erichthonius about 1506 or 1521 B.C. The later Panathenæa appears to have been a double festival. All writers who mention it speak of a lesser and greater Panathenæa, the former held annually, the latter every fourth year. Both took place in the month *Hecatombæon* (July), and lasted several days. The lesser Panathenæa was celebrated with gymnastic games, musical competitions, declamations, and a torch race in the evening, the whole concluding with the sacrifice of an ox. The prize of the victors was a vessel filled with oil from the sacred tree on the Acropolis. The greater Panathenæa only differed from the lesser in being more solemn and magnificent. Rhapsodists sang the Homeric poems: dramatic representations were given; and a splendid procession took place to the temple of Athene Polias on the last day of the festival, to present the goddess with a *peplus* or embroidered robe, of crocus color, woven by the maidens (*ergastînai*) of the city. Not alone the Athenians, but the whole population of Attica poured forth on this occasion. The procession is grandly sculptured on the frieze of the Parthenon by Phidias and his disciples.

PANAX. See GINSENG.

PANAY. See PHILIPPINE ISLANDS.

PANCAKE. This article of food is prepared by pouring a rich batter of flour, eggs, and milk into a frying-pan, so as to cover it about half an inch in thickness; the pan having been previously heated and well supplied with butter, lard, or olive oil. A quick fire is necessary to cook it well, and when the under side is done, a dexterous cook by jerking the frying-pan manages to reverse the cake, so as to bring the upper side downward to be cooked in its turn. It is now a common practice to make pancakes rather smaller than the bottom of the pan, and frequently to add minced apples and other materials to vary and flavor them; these are, however, better known under the name of fritters.

This dish is particularly associated with Shrove Tuesday, but the origin of the connection is by no means clear. Perhaps it is the relic of a heathen custom. The Saxons called February *Solmonath,* "which," says a writer in *Notes and Queries* (first series, vol. v. p. 491), "Dr. Frank Sayers, in his *Disquisitions,* says is explained by Bede, *Mensis Placentarum,* and rendered by Spelman, in an inedited MS., 'pancake month,' because, in the course of it pancakes were offered by the pagan Saxons to the sun."

PANCHATANTRA (literally, the five books) is the name of the celebrated Sanskrit fable-book of the Hindus, whence the *Hitopadeça* (q.v.) was compiled and enlarged. Its authorship is ascribed to a Brahman of the name of Vishn'us'arman, who, as its introduction in a later recension relates, had undertaken to instruct, within six months, the unruly sons of Amaras'akti, a king of Mahilâropya or Mihilâropya, in all branches of knowledge required by a king, and for this purpose composed this work. If the latter part of this story be true, it is more probable, however, as prof. Benfey assumes, that Vishn'us'arman was merely the teacher of the princes, and that the existing work itself was composed by some other personage; for an older recension of the work does not speak of his having brought his tales into the shape of a work. The arrangement of the Panchatantra is quite similar to that of the *Hitopades'a.* The fables are narrated in prose, and the morals drawn from or connected with them are interwoven with the narrative in verse; many such verses, if not all, being quotations from older works.—On the history of the Panchatantra and its relation to the fable-books and fables of other nations, see the excellent work of prof. Theodor Benfey, *Panchatantra: fünf Bücher Indischer Fabeln, Märchen und Erzählungen* (2 vols. Leip. 1859), the first volume containing his historical and critical researches on, and the latter his literal translation into German of, the *Panchatantra.*

PANCKOUCKE, CHARLES JOSEPH, 1736–98; b. in Lisle, France; son of a noted publisher of French Protestant works; died in Paris. He continued the business and became eminent as an editor as well as publisher. He edited Buffon's works, published *Le Grand Vocabulaire Français; Le Repertoire de Jurisprudence;* and *Le Voyageur Français;* in all about 100 vols. Voltaire named him to edit his works, but the work fell upon Beaumarchais. The *Encyclopédie Méthodique,* in 47 vols. illustrated, was his great work. He was one of the editors of the *Mercure Français,* and joint founder with La Harpe, Andrieux, and Regnier, of the *Moniteur.*

PANCKOUCKE, CHARLES LOUIS FLEURY, 1780–1844; b. in Paris; son of Charles Joseph, publisher and editor; educated to the law, but became associate and successor in the publishing business of his father. Among his issues are the *Dictionaire des Sciences Médicales,* 60 vols., 1812; *Biographie Médicale;* and *Flore Médicale;* the latter illustrated by his wife; besides a great number of works on general subjects. He wrote a few small works, among which is the *Budget Statistique d'un Editeur,* 1837. His wife was an artist of skill, and the translator of a prose edition in French of the poems of Goethe. The

Bibliothèque Latine-Française in 174 volumes, 1828, was from this house, which has since maintained its reputation under the direction of Ernest Panckoucke, son, b. 1806, and long a director of the *Moniteur*.

PANCOAST, Joseph, b. N. J., 1805; educated at the university of Pennsylvania, where he took his degree in medicine, 1828. In 1831 he became instructor of surgery and anatomy; and in 1834 was chosen physician-in-chief of the Philadelphia and Children's hospitals. In 1861 he was made professor of anatomy in the Jefferson medical college, where for many years previous he had given instruction in surgery. From 1838 to 1845 he was visiting surgeon of the Philadelphia hospital. Dr. P. made many contributions to the medical and scientific periodicals, he edited Wistar's *Anatomy* and other text books, and is the author of a work on *Operative Surgery*. He d. 1882.

PANCREAS (from the Gr. *pan*, all, and *kreas*, flesh) is a conglomerate gland, lying transversely across the posterior wall of the abdomen, varying in length from six to eight in., having a breadth of about an inch and a half, and a thickness of from half an inch to an inch. Its usual weight is about three ounces. The head of the pancreas lies in the concavity of the duodenum.

The secretion of this gland, or the pancreatic fluid, is conveyed from its various parts by means of the pancreatic duct to the duodenum. This gland is found in all mammals, birds, reptiles, amphibians, and osseous fishes, and in some cartilaginous fishes.

The physical and chemical characters of the pancreatic fluid, and its uses in the animal economy, are sufficiently noticed in the article Digestion.

The diseases of the pancreas are few, and do not signify their existence by any very marked symptoms. The presence of undigested fat in the stools has been frequently observed in cases in which after death the pancreas has been found to be diseased; and if Bernard's views regarding the saponifying power of the pancreatic juice on fatty matters (described in the article already referred to) be correct, the reason why the fat should appear in the evacuations in these cases is sufficiently obvious. The most common form of disease is cancerous deposit in the head of the gland, which frequently induces jaundice by obstructing the common biliary duct near its opening. An accurate diagnosis of disease of this organ is extremely difficult, but fortunately is of comparatively little importance, as it cannot lead to efficient treatment; all that can be done in these cases being to palliate the most distressing symptoms.

The pancreas of ruminating animals is a favorite article of food under the name of sweetbread. That of the calf is most highly esteemed, but that of the lamb is often substituted for it. Dr. Edward Smith questions whether the very high price often paid for calf's sweetbread is warranted by its nutritive qualities, or even by its flavor; although he allows that the flavor is perhaps the most delicate of any meat we are acquainted with. It is either boiled or fried. The thyroid and sublingual glands are also used as sweetbread.

PANCRE'ATINE, a proteid substance forming the active principle of the pancreatic juice. This secretion as obtained from healthy animals is a viscid, slightly opaline fluid having an alkaline reaction and a very slight peculiar animal odor and taste. Bernard found its specific gravity in a good specimen taken from a dog to be 1.040. It contains a large amount of organic matter, and completely solidifies on the application of heat, this property distinguishing the normal fluid from that which has undergone change. The following is the composition of the pancreatic juice of a dog, according to Bernard. Water 900 to 920; organic matter (pancreatine) precipitable by alcohol, and always containing a little lime 73.6 to 90; chloride of sodium, chloride of potassium, carbonate of soda, and phosphate of lime, in all, 6.4 to 10 in 1000 parts. The chemical properties of the organic principle of the pancreatic juice are characteristic. Like albumen, it is coagulated by heat, mineral acids, and alcohol, but its dried alcoholic precipitate will redissolve in water and retain all its physiological properties, while the precipitated albumen will not redissolve. Bernard further ascertained that pancreatine is coagulated by an excess of sulphate of magnesia, which will also coagulate caseine, but not albumen. This is an important distinction, as it is necessary sometimes to be able to distinguish between a fatty emulsion made with pancreatic secretion or with albumen, each having the property of forming emulsions with fats. Pancreatic juice, although normally alkaline, does not lose its peculiar digestive properties when rendered acid, as it usually is when the partly digested contents of the stomach are emptied into the duodenum. There are, apparently, no distinctive properties given it by its inorganic accompaniments, and Bernard has shown that the organic principle, or pancreatine alone, when extracted from the secretion and dissolved in water is capable of performing the same physiological work as the natural secretion. See Pancreas, Digestion.

PANCSOVA, a municipality of Hungary, Torontál co., 10 m. e.n.e. of Belgrade, and close to the mouth of the Temes in the Danube, which is here a mile wide. It is a military station, contains several churches, a high school, and a quarantine establishment. Silk-spinning, brandy-distilling, and an active trade in cattle, pigs, and corn are carried on. Pop. '90, 17,948.

PANDA, *Ailurus fulgens*, a quadruped of the family *ursidæ* (see Bear), a native of the Himalayas, the only known species of its genus, which has a very short muzzle, small rounded ears, a moderately long tail, covered with long hair, semi-retractile

claws. The panda is about the size of a large cat. It dwells chiefly in trees, preying much on birds, but it also eats small quadrupeds and large insects. It has a thick, fine, woolly covering, adapting it to a cold climate, concealed by long, soft glistening, and richly colored hair, mostly chestnut brown, which passes into black on the sides and legs, and into white on the head. The panda is said to excel all other animals in the brilliancy of its fur, which, however, has not yet acquired any commercial value. The soles of the feet are thickly covered with woolly hair. The panda is also called *wah* and *chit-wa*, from a peculiar cry which it utters.

PANDANACEÆ, a natural order of endogenous plants, constituting a remarkable feature in the scenery of many tropical countries, but unknown in the colder regions of the globe. They are trees or bushes, often sending down adventitious roots, sometimes weak and decumbent, or climbing. There are two sections of the order, one (*pandaneæ*) including the genera *pandanus*, *freycinetia*, etc., having long, simple, imbricated leaves, usually spiny on the back and margin, their base embracing the stem, their spiral arrangement often notably visible; the other (*cyclantheæ*) containing the genera *cyclanthus*, *nipa* (q.v.), *carludovica*, *phytelephas*, etc., having pinnate or fan-shaped leaves, and in general appearance much resembling palms, with which they have been often ranked. The two sections, however, are very similar in their flowers and fruit, in which they not a little resemble the humbler *araceæ* and *typhaceæ*. The flowers are mostly unisexual, naked, or with only a few scales, arranged on a spadix, and wholly covering it. The stamens are numerous; the ovaries usually clustered, one-celled, each crowned with a stigma; the fruit consists of fibrous, one-seeded drupes, collected or almost combined, or of berries with many seeds.—There are not quite 100 known species. Some are valuable for the fiber of their leaves, some for their edible fruit, etc. See Screw Pine, Kiekie, and Nipa. The unexpanded leaves of *Carludovica palmata* furnish the material of which *Panama hats* are made. The tree which yields vegetable ivory (q.v.) is another of the palm-like section of this order.

PAN'D'AVAS, or the descendants of Pân'd'u (q.v.), is the name of the five princes whose contest for regal supremacy with their cousins, the Kurus, the sons of Dhr'itarâsht'ra, forms the foundation of the narrative of the great epic poem, the *Mahâbhârata* (q.v.). Their names are *Yudhisht'hira*, *Bhima*, *Arjuna*, *Nakula*, and *Sahadeva*—the former three being the sons of Pân'd'u, by one of his wives, Pr'ithâ; and the latter two by his other wife, Mâdrî. But though Pân'd'u is thus the recognized father of these princes, the legend of the *Mahâbhârata* looks upon him, in truth, merely as their father by courtesy; for it relates that Yudhisht'hira was the son of Dharma, the god of justice; Bhîma, of Vâyu, the god of wind; Arjuna, of Indra, the god of the firmament; and Nakula and Sahadeva, of the As'wins, the twin-sons of the sun.

PANDECTS (Gr. *Pandecton*, all-receiving; from *pan*, all, and *dechomai*, I receive), one of the celebrated legislative works of the emperor Justinianus (q.v.), called also by the name *Digestum*, or Digest. It was an attempt to form a complete system of law from the authoritative commentaries of the jurists upon the laws of Rome. The compilation of the pandect was undertaken after that great collection of the laws themselves which is known as the Codex Justinianeus. It was intrusted to the celebrated Tribonianus, who had already distinguished himself in the preparation of the Codex. Tribonianus formed a commission consisting of 17 members, who were occupied from the year 530 till 533 in examining, selecting, compressing, and systematizing the authorities, consisting of upwards of 2,000 treatises, whose interpretation of the ancient laws of Rome was from that time forward to be adopted with the authority of law. A period of 10 years had been allowed them for the completion of their work; but so diligently did they prosecute it that it was completed in less than one-third of the allotted time; and some idea of its extent may be formed from the fact that it contains upward of 9,000 separate extracts, selected according to subjects from the 2,000 treatises referred to above.

The Pandects are divided into 50 books, and also into 7 parts, which correspond respectively with books 1–4, 5–11, 12–19, 20–27, 28–35, 36–44, and 45–50. Of these divisions, however, the latter (into parts) is seldom attended to in citations. Each book is subdivided into titles, under which are arranged the extracts from the various jurists, who are 39 in number, and are by some called the classical jurists, although other writers on Roman law confine that appellation to five of the number, Papinian, Paulus, Ulpian, Gaius (q.v.), and Modestinus. The extracts from these indeed constitute the bulk of the collection; those from Ulpian alone making one-third of the whole work, those from Paulus one-sixth, and those from Papinian one-twelfth. Other writers besides these 39 are cited, but only indirectly, i.e., when cited by the jurists whose works form the basis of the collection. The principle upon which the internal arrangement of the extracts from individual writers was made had long been a subject of controversy. The question seems now to be satisfactorily solved; but the details of the discussion would carry us beyond the prescribed limits. Of the execution of the work it may be said that although not free from repetition (the same extracts occurring under different heads), and from occasional inaptness of citation, and other inconsistencies, yet it deserves the very highest commendation. In its relations to the history and literature of ancient Rome it is invaluable; and taken along with its necessary complement, the Codex, it may justly be

regarded (having been the basis of all the mediæval legislation) as of the utmost value to the study of the principles not alone of Roman, but of all European law.

PANDEMONIUM (Greek, "all-demoniac"). This name was given by Milton (q. v.) to the "high capital of Satan and his peers," in his *Paradise Lost*, Book I., verse 756.

PAN'OLA, a co. in n.w. Mississippi, intersected centrally by the Illinois Central railroad, crossing the Tallahatchee river at Panola in the centre of the county; 680 sq. m.; pop. '90, 26,977, chiefly of American birth, including colored. It is drained by the Tallahatchee and its branches, one of which forms its s.e. boundary. Its surface is diversified by small lakes, groves of cypress, magnolia, and elm, and forests of good building timber. Its soil is fertile, and adapted to the raising of live stock and the production of grain, cotton, tobacco, and sweet potatoes. Its principal manufactures are leather and flour. Co. seats, Batesville and Sardis.

PAN'OLA, a co. in e. Texas, having the state line of Louisiana for its e. boundary, drained by the headwaters of the Sabine river; 800 sq.m.; pop. '90, 14,328, chiefly of American birth, inclu. colored. Its surface is generally level, a large proportion covered with dense forests of pine, oak, and hickory, ash, and walnut trees. Its soil is fertile, adapted to stock-raising, and the production of grain, cotton, sweet potatoes, fruit, and dairy products. Co. seat, Carthage.

PANDO'RA (i.e., the "All-endowed"), according to Grecian myth, was the first woman on the earth. When Prometheus had stolen fire from Jupiter, Zeus instigated Hephæstus to make woman out of earth to bring vexation upon man by her graces. The gods endowed her with every gift necessary for this purpose, beauty, boldness, cunning, etc.; and Zeus sent her to Epimetheus, the brother of Prometheus, who forgot his brother's warning against receiving any gift from Zeus. A later form of the myth represents Pandōra as possessing a vessel or box filled with winged blessings, which mankind would have continued to enjoy if curiosity had not prompted her to open it, when all the blessings flew out, except hope.

PANDOURS, a people of Servian origin who lived scattered among the mountains of Hungary, near the village of Pandour in the county of Sohl. The name used to be applied to that portion of the light-armed infantry in the Austrian service which is raised in the Slavonian districts on the Turkish frontier. The Pandours originally fought under the orders of their own proper chief, who was called Harûn-Basha, and rendered essential service to the Austrians during the Spanish war of succession, and afterward in the Seven Years' War. They originally fought after the fashion of the "free lances," and were a terror to the enemy whom they annoyed incessantly. Their appearance was exceedingly picturesque, being somewhat oriental in character, and their arms consisted of a musket, pistols, a Hungarian saber, and two Turkish poniards. Their habits of brigandage and cruelty rendered them, however, as much a terror to the people they defended as to the enemy. Since 1750 they have been gradually put under a stricter discipline, and are now incorporated with the Austrian frontier regiments. The name is now obsolete.

PAN'D'U, literally, "white," is the name of the father of the Pân'd'avas (q.v.), and the brother of Dhr'itarâsht'ra. Although the elder of the two princes, he was rendered by his "pallor"—implying, perhaps, a kind of disease—incapable of succession, and therefore obliged to relinquish his claim to his brother. He retired to the Himalaya mountains, where his sons were born, and where he died. His renunciation of the throne became thus the cause of contest between the Pân'd'avas, his sons, and the Kurus, or the sons of Dhr'itarâsht'ra.

PANEL (through Fr. from Lat. *pannus*, a piece of cloth, a patch), a space or compartment of a wall, ceiling, woodwork, etc., inclosed by beams, moldings, framing, and so forth. It is generally sunk under the plane of the surrounding styles. In woodwork, panels are thinner parts used to fill in strong framing, as in doors, shutters, etc. These are sometimes highly ornamented with tracery, shields, etc. In late Gothic architecture, the panel is very often carved into the "linen pattern." Paneling is a style of ornament greatly used in Elizabethan architecture. The ceilings and walls are covered with it, and every piece of furniture is cut up into panels of every variety of form. Panels are said to be "fielded" when the center of the panel is raised with moldings, etc.

PANEL (properly the slip or "pane" of parchment on which the names of the jurors are written) is, in the practice of the American law, used to denote the body or set of jurors consisting of 12 men, who try a cause, civil or criminal. In Scotch criminal law the prisoner is usually called the panel.

PANGÉ LINGUA (Lat. "Proclaim, O Tongue"), one of the most remarkable of the hymns of the Roman breviary, and like its kindred hymn, *Lauda Sion*, a most characteristic example as well of the mediæval Latin versification as of that union of theology with asceticism, which a large class of these hymns present. The Pange Lingua is a hymn in honor of the eucharist, and belongs to the service of the festival of Corpus Christi. It is from the pen of the great angelic doctor, Thomas Aquinas (q.v.), and consists of six strophes of verses in alternate rhyme. Besides its place in the office of the breviary, this hymn forms part of the service called benediction with the blessed sacra-

ment, and is sung on all occasions of the exposition, procession, and other public acts of eucharistic worship.

PANGOLIN, or PENGOLIN, a name sometimes extended to all the species of *manis* (q.v.), but originally belonging to *M. pentadactyla,* also called SHORT-TAILED MANIS, and in some parts of India BAJJERKEIT; this species being a native of most parts of the East Indies, and pangolin, its Malayan name, derived from a word which signifies to roll up; the animal having the habit of rolling itself up, on apprehension of danger, into a compact ball, the head in the center, and its muscular mail-covered tail enfolding all. The food of the pangolin consists chiefly of ants, and like the rest of the genus, it is entirely destitute of teeth, and has a round, extensile tongue. Its claws are long and strong; it doubles them up like the American ant-eaters when it walks. It resides in burrows, which it excavates to the depth of 7 or 8 ft. in the ground. It is capable of climbing trees, and the tail is prehensile. The whole length of the animal, including the tail, is almost 5 ft., the tail being not quite half the length of the body. It is a gentle animal, easily tamed, and of an affectionate disposition.

PANIC is where fear, whether arising from an adequate or inadequate cause, obtains the mastery over every other consideration and motive, and urges to dastard extravagance, or hurries into danger or death. An inexplicable sound causes a rush from a church, a vague report in the market-place causes a run on a bank, and precipitate the very events that are dreaded. This emotion either differs from natural apprehension, or presents so intense and uncontrollable a form of the feeling, that it is propagable from one person to another, and involves alike the educated and ignorant—those who act from judgment as well as those who act from impulse. There are, besides this feature, several grounds for believing that such manifestations of involuntary terror are of morbid origin, and should be regarded as moral epidemics. They have generally arisen during, or have followed, seasons of scarcity and physical want and disease, the ravages of war, or periods of great religious fervor and superstition. The dancing mania, the retreat of the French army from Moscow, and recent and familiar commercial panics afford illustrations of certain of these relations. The most notable instance of universal panic, and that which demonstrates most aptly the connection here indicated, is the dread of the approaching end of the world which pervaded all minds, and almost broke up human society in the 10th century. The empire of Charlemagne had fallen to pieces; public misfortune and civil discord merged into misery and famine so extreme that cannibalism prevailed even in Paris; superstitious and vague predictions became formalized into a prophecy of the end of all things and universal doom in the year 1000. This expectation suspended even vengeance and war. The "truce of God" was proclaimed. Enormous riches were placed upon the altars. Worship and praise never ceased. The fields were left uncultivated; serfs were set free; four kings and thousands of nobles retired to the cloister; and all men, according to their tendencies, prepared to die.

One of the most marked features of the recent economic history is the commercial crisis or panic. A panic usually results from overtrading and speculation. The question of the periodicity of these economic crises has aroused much discussion. It is commonly stated that a panic recurs about every ten years and the financial history of the United States and European countries affords some ground for this statement. The most noted panics in history were those of the 18th century in France and England. See the articles MISSISSIPPI SCHEME and SOUTH SEA SCHEME.

PANICLE, in botany, a mode of inflorescence (q.v.) in which the floral axis is not only divided, but also subdivided more or less frequently. The panicle may thus be regarded as a raceme (q.v.), of which the branches (or flower-stalks) are branched. The panicle is a very common kind of inflorescence. Most of the grasses exhibit it, and many other plants, both endogenous and exogenous. The common lilac affords a good example of it. The panicle, variously modified as to its form, and the arrangement and relative lengths of its branches and branchlets, becomes a cyme (q.v.), Thyrsus (q.v.), etc. See illus., GRAIN, ETC., vol. VI.

PANICUM. See MILLET.

PAN'INI, the greatest known grammarian of ancient India, whose work on the Sanskrit language has up to the present day remained the standard of Sanskrit grammar. Its merits are so great that Panini was ranked among the Rishis (q.v.), or inspired seers, and at a later period of Sanskrit literature, was supposed to have received the fundamental rules of his work from the god Siva himself. Of the personal history of Panini nothing positive is known, except that he was a native of the village Salâtura, situated n.w. of Attock, on the Indus—whence he is also surnamed Sâlâturîya—and that his mother was called Dâkshî, wherefore, on his mother's side, he must have been a descendant of the celebrated family of Daksha. A tale-book, the *Kathâsaritsâgara* (i. e., the ocean for the rivers of tales), gives, indeed, some circumstantial account of the life and death of Panini; but its narrative is so absurd, and the work itself of so modern a date—it was written in Cashmere, at the beginning of the 12th c.—that no credit whatever can be attached to the facts related by it, or to the inferences which modern scholars have drawn from them. According to the views expressed by Goldstücker (*Pânini, his Place in Sanskrit Literature:* London, 1861), it is probable that Panini lived before Sâkyamuni, the founder of the Buddhist religion, whose death took place about 543 B.C., but that a more

definite date of the great grammarian has but little chance of ascertainment in the actual condition of Sanskrit philology. The grammar of Panini consists of eight Adhyâyas, or books, each book comprising four pâdas, or chapters, and each chapter a number of Sûtras (q.v.), or aphoristical rules. The latter amount in the whole to 3,996; but three, perhaps four, of them did not originally belong to the work of Panini. The arrangement of these rules differs completely from what a European would expect in a grammatical work, for it is based on the principle of tracing linguistic *phenomena*, and not concerned in the classification of the linguistic *material*, according to the so-called parts of speech. A chapter, for instance, treating of a prolongation of vowels, will deal with such a fact wherever it occurs, be it in the formation of bases, or in conjugation, declension, composition, etc. The rules of conjugation, declension, etc., are, for the same reason, not to be met with in the same chapter or in the same order in which European grammars would teach them; nor would any single book or chapter, however apparently more systematically arranged—from a European point of view—such as the chapters on affixes or composition, suffice by itself to convey the full linguistic material concerned in it, apart from the rest of the work. In a general manner, Panini's work may therefore be called a natural history of the Sanskrit language, in the sense that it has the strict tendency of giving an accurate description of facts, instead of making such a description subservient to the theories according to which the linguistic material is usually distributed by European grammarians. Whatever objections may be raised against such an arrangement, the very fact of its differing from that in our grammars makes it peculiarly instructive to the European student, as it accustoms his mind to survey language from another point of view than that usually presented to him, and as it must induce him, too, to question the soundness of many linguistic theories now looked upon as axiomatic truths. As the method of Panini requires in a student the power of combining many rules scattered all over the work, and of combining, also, many inferences to be drawn from these rules, it exercises, moreover, on the mind of the student an effect analogous to that which is supposed to be the peculiar advantage of the study of mathematics. The rules of Panini were criticised and completed by Kâtyâyana (q.v.), who, according to all probability, was the teacher, and therefore the contemporary, of Patanjali; and he, in his turn, was criticised by Patanjali (q.v.), who sides frequently with Panini. These three authors are the canonical triad of the grammarians of India; and their works are, in truth, so remarkable in their own department, that they exceed in literary merits nearly all, if not all, grammatical productions of other nations, so far as the two classes are comparable. The rules of Panini were commented on by many authors. The best existing commentary on them is that called the *Kâsikâvritti*, by Vâmana Jayâditya, which follows these rules in their original order. At a later period, attempts were made to arrange the rules of Panini in a manner which approaches more to the European method; the chief work of this category is the *Siddhânta-Kaumudî*, by Bhattoji-dîkshita. Panini mentions, in his Sûtras, several grammarians who preceded him, among others Sâkatâyana. Manuscripts of a grammar ascribed to a grammarian of this name exist in the library of the India office in London, and in the library of the Board of examiners at Madras. On the ground of a few pages only of the latter an attempt has been very recently made to prove that this grammar is the one referred to by Panini, and therefore older than the work of the latter. But the facts adduced in proof of this hypothesis are so ludicrously weak, and the reasoning upon them so feeble and inconclusive, whereas the evidence in favor of the comparatively recent date of this work is so strong, that no value whatever can be attached to this hasty hypothesis. For the present, therefore, Panini's work still remains the oldest existing grammatical work of India, and probably of the human race. The Sûtras of Panini, with a modern commentary by two native pandits, and with extracts from the *Vârttikas* of Kâtyâyana and the *Mahâbhâshya* of Patanjali, were edited at Calcutta in 1809. This edition, together with the modern commentary, but with garbled extracts from the extracts mentioned, was reprinted at Bonn in 1839–1840 by Dr. O. Boehtlingk, who added to it remarks of his own and some indices. For the literature connected with Panini, see Colebrooke's preface to his *Grammar of the Sanskrit Language* (Calc. 1805), and Goldstücker's *Panini*, etc., as mentioned above.

PANIPUT', the chief t. of the district Kurnal, in the division of Delhi, Punjab, is situated 56 m. (by road 78 m.) n. by w. from Delhi, in a fertile tract, the resources of which are largely developed by artificial irrigation. Pop. 25,022. Being a station on the great military road between Afghanistan and the Punjab, and to some extent an outpost of Delhi, it has been at various times the scene of strife between the inhabitants of India and invaders. The *first* great battle of Paniput was fought in 1526, and gained by Mirza Baber, the ex-ruler of Ferghana, at the head of 12,000 Mongols, over Ibrahim the emperor of Delhi, whose unwarlike array numbered 100,000 men, with 1000 elephants. This victory seated Baber on the throne of Hindustan as the first of the "Great Mogul" dynasty. The *second* great battle was fought in 1556, by the Mongols under Akbar, grandson of Baber, and third of the Mogul emperors, against Hemu, an Indian prince who had usurped the throne of Delhi. Hemu's army was defeated with great slaughter, and himself slain. The *third* battle was fought on Jan. 14, 1761, between Ahmed Abdalli, ruler of Afghanistan, and the till then invincible Mahrattas. The Jats, who had been forced to join the Mahrattas, deserted to the

Afghans at a time when victory seemed to be declaring for the former; and this act of treachery, together with the loss of their leaders, threw the Mahrattas into confusion, and in spite of their most resolute valor they suffered a total defeat. They left 50,000 slain on the field of battle, including all their leaders except Holkar, and 30,000 men were killed in the pursuit, which was continued for four days. The Mahrattas never recovered this crushing blow. It was at Kurnaul, a town a little to the n of Paniput, that Nadir Shah of Persia, in 1739, won the celebrated battle over the Mogul emperor, which placed n.w. India at his feet.

PANIZZI, Sir ANTONIO, principal librarian of the British museum from 1856 to 1866, b. Sept. 16, 1797, at Brescello, in the *ci-devant* duchy of Modena. For his education he was sent first to the public school of Reggio, and afterwards to the university of Parma, where, in 1818, he took the degree of doctor of laws, with a view to practicing at the bar. Early in life his sympathies were enlisted on behalf of the friends of Italy, as opposed to domestic tyranny and foreign intrusion, and when, in 1821, the popular revolution broke out in Piedmont, the young advocate became one of its leaders. The attempt, however, failed; and Panizzi, who had been denounced by a pretended friend, was arrested at Cremona. Having by some means contrived to escape, he took refuge in Lugano, and from thence in a short time found his way to Geneva. Meanwhile, during his absence, he was tried at home *per contumaciam*, as it is called, and sentenced to death, with confiscation of property. Nor was he allowed to remain at Geneva. The governments of Austria and Sardinia demanded from the Swiss confederation the expulsion of all concerned in the recent outbreak, and among these Panizzi was obliged to depart. Forbidden to pass through France, he reached England by way of Germany and the Netherlands. He now resided for about a month in London, whence he proceeded to Liverpool, with an introduction from Ugo Foscolo to Roscoe the historian, who received him with the utmost hospitality. At Liverpool, where he was introduced into the best circles by Mr. Roscoe, he taught Italian, and continued to reside in that town until 1828, when he came to London again, and was chosen professor of Italian in the university of London, just then opened for students. In 1831, through the instrumentality of lord Brougham, he was appointed one of the assistant-librarians in the British museum; and upon the retirement of the rev. Mr. Baber, in 1837, from the office of keeper of the printed books, Panizzi was appointed his successor. In the previous year there had been a parliamentary committee on the state of the British museum, before which Panizzi gave valuable evidence, and likewise urged the adoption of measures for the improvement and augmentation of the library, which, upon becoming keeper, he was in a still better position to advocate. In 1838 he superintended the removal of the printed books from the old suite of rooms in Montague House to the new library; and in the same year, in conjunction with some of his assistants, he drew up the well-known 91 rules for the formation of a new catalogue of the library. These rules were approved by the trustees, and the first volume of a catalogue framed after them was printed and published in 1841. No other volume has been since published, and Panizzi, before a royal commission of inquiry into the museum in 1847, justified the suspension of the printing until the whole catalogue should be finished. In 1845, Panizzi drew up an elaborate report of the deficiencies existing in the library, in consequence of which the trustees applied to the lords of the treasury for "an annual grant of £10,000 for some years to come, for the purchase of books of all descriptions." This grant having been obtained, the library rapidly increased in numbers, to such a degree that in 1849 the books amounted to 435,000, as compared with 235,000, the ascertained number in 1838. The number of volumes is now estimated at considerably over 1,000,000. Upon the resignation of sir H. Ellis, in 1856, Panizzi was appointed to the post of principal librarian of the British museum, an office he held ten years. In a literary capacity, Panizzi is known by an edition of the *Orlando Innamorato di Boiardo, and Orlando Furioso di Ariosto: with an Essay on the Romantic Narrative Poetry of the Italians, Memoirs and Notes, by A. Panizzi* (9 vols. Lond. 1830–34). Panizzi also edited the *Sonetti e Canzoni* of Boiardo (Lond. 1835), and a collection of reprints of the first four editions of the *Divina Commedia*, printed at the expense of lord Vernon (Lond. 1858). He was also the author of a privately printed pamphlet, *Chi era Francesco da Bologna*, tending to prove the identity of the type-founder employed by Aldus, and the inventor of the well-known Aldine or Italic type, with the painter Francesco Francia. Panizzi is also understood to have written articles for some of the quarterly reviews. Panizzi retired on a pension in 1866. In 1869 he received the order of K.C.B. He d. 1879.

PANJIM. See GOA.

PANNA, or PUNNAH, a decayed t. of India, in the district of Bundelcund, stands on the north-eastern slope of a plateau, 105 m. n.e. of Jabalpur. It was formerly a large, thriving, and well-built town; but whole streets are now desolate, or are tenanted only by monkeys, which, posted on the roof or at the windows, view the towns-people without alarm. The palace of the rajah is a beautiful building, surmounted by elegant kiosks, but is in many places ruinous. The source of the former prosperity of Panna was its rich diamond mines. Owing to the diminished value of the gem, however, and the increased tax upon the produce of the mines, this branch of industry has much fallen off. The diamonds are generally tinted with color; very few of them being of first-water, or

completely colorless. This town is the capital of a state of the same name which is bounded on the n. by the British district of Banda, and on the s. by the British district of Nerbudda. Pop. town, 14,700. See BUNDELCUND.

PANNELS, in artillery, are the carriages upon which mortars and their beds are conveyed on a march.

PANNO'NIA, a province of the ancient Roman empire, bounded on the n. and e. by the Danube, on the w. by the mountains of Noricum, and on the s. reaching a little way across the Save; and thus including part of modern Hungary, Slavonia, parts of Bosnia, of Croatia, and of Carniola, Styria, and lower Austria. It received its name from the Pannonians, a race of doubtful origin, but who at first dwelt in the country between the Dalmatian mountains and the Save, in modern Bosnia, and afterward more to the s.e. in Moesia. The Roman arms were first turned against them and their neighbors, the Iapydes, by Augustus in 35 B.C., and after the conquest of Segestica or Siscia (Siszek) he subdued them. An insurrection took place in 12 B.C., which Tiberius crushed after a long struggle; and a more formidable one of the Dalmatians and Pannonians together in 6 A.D., which was suppressed by Tiberius and Germanicus, but not till 8 A.D. Fifteen legions had to be assembled against the Pannonians, who mustered 200,000 warriors. Hereupon the Pannonians settled in the more northern countries, which received their name, and of which the former inhabitants, the Celtic Boii, had been in great part destroyed in Cæsar's time. The country was now formed into a Roman province, which was secured against the inroads of the Marcomanni and Quadi by the Danube, and on its other frontiers had a line of fortresses. Military roads were constructed by the conquerors, who also planted in the country many colonies and municipia, and thus gave it a rough coating of civilization. Great numbers of the Pannonian youth were drafted into the Roman legions, and proved, when disciplined, among the bravest and most effective soldiers in the imperial army. Pannah was subsequently divided into upper (or western) and lower (or eastern) Pannonia, and under Galerius and Constantine underwent other changes. Upper Pannonia was the scene of the Marcomannic war in the 2d century. In the 5th c. it was transferred from the western to the eastern empire, and afterward given up to the Huns. After Attila's death, in 453, the Ostrogoths obtained possession of it. The Longobards under Alboin made themselves masters of it in 527, and relinquished it to the Avari upon commencing their expedition to Italy. Slavonian tribes also settled in the south. Charlemagne brought it under his scepter. In the reigns of his successors, the Slavonians spread northward, and the country became a part of the great Moravian kingdom, till the Magyars or Hungarians took it in the end of the 9th century. In the time of the Romans, Siscia (Siszek), Vindobona (Vienna), Carnuntum (near Haimburg), and Arrabo (Raab), were among its principal towns.

PANORAMA (Gr. *pan,* all, *orama,* a view), a pictorial representation of the whole surrounding landscape as seen from one point. The invention of the panorama is claimed by the Germans for Prof. Breisig of Dantzic, but it does not appear that he ever constructed one. The real inventor was Mr. Barker, an ingenious artist of Edinburgh, to whom the idea occurred while taking a sketch of the city from the top of Arthur Seat. After surmounting numerous difficulties—one of which was the invention of a new kind of perspective for the horizontal lines—he succeeded in producing an effective panoramic view of Edinburgh, which was exhibited in that city in 1788, and in London in the following year. The next panorama executed by Barker was a view of London from the top of the Albion mills. A large building was now erected in Leicester square for the exhibition of such views. On Mr. Barker's death in 1806, he was succeeded by his son, in partnership with a pupil, Mr. Burford, the painter of the chief modern panoramas. The first step in the construction of a panorama is to obtain sketches of the entire region to be represented; each sketch is a representation of a portion of the landscape in the form of a sector of a circle, with the sketcher's position as a center, and the horizon for circumference. The canvas to which the sketches are to be transferred is hung round the sides of a circular room, and forms the surface of a cylinder, on the inside of which the panorama is painted. The canvas, brushes, etc., are of the finest description manufactured, and the painting and coloring are elaborated in the most careful manner, in order to render the optical illusion—which every one who has seen a good panorama must have experienced—as complete as possible. The stage from which the picture is viewed is placed in the center of the room, about 30 ft. on every side from the picture; the picture itself is fastened above to a strong circular hoop, and, hanging down, has its lower edge fastened to a similar hoop, which is heavily weighted to keep the picture steady. The light is admitted by an aperture in the roof, which is concealed by an awning from the spectators on the stage. Notwithstanding important defects in the panorama, one of which is that the light more strongly illumines the upper than the lower parts of the picture—thus throwing the foreground comparatively into shade—many cases are on record of spectators being for the time completely under the influence of mental illusion. One of the best instances of this occurred during the exhibition of the third panorama in London. Part of the view consisted of a representation of the wreck of a ship's boat, with sailors struggling in the waves; and at sight of this, a dog belonging to one of the spectators at once leaped over the handrail to the rescue of the sup-

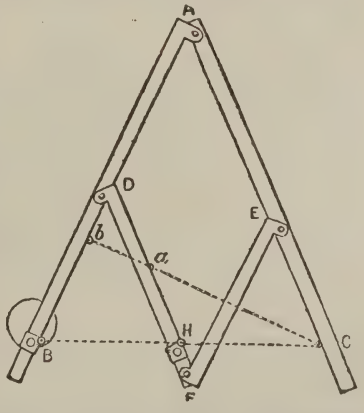
posed drowning men. Panoramas are frequently exhibited in France, Germany, and other European countries, and have met with great success in the United States. A very popular panorama in this country of the battle of Gettysburg, was exhibited in New York for more than three years (1888–91).

PANORMUS. See PALERMO.

PANSLAVISM. This term is applied to the movement lately set on foot, and generally ascribed to Russian influence, for the amalgamation of all races of Slavonic descent into one body, having one language, one literature, and one social polity. The writings of Adam Gurowski and Kollar, and the anonymous pamphlet which appeared at Leipsic in 1837, under the title of *Die Europæische Pentarchie*, have exercised a very widespread influence in this direction among all the Slavonic people of the German states; and although the other nations of Europe have hitherto had no reason to anticipate any practical results from a movement towards Panslavism, the Slavonians of the Austrian empire have always taken occasion to show that they regarded themselves as standing apart from German interests in times of public disturbance. Thus, in 1848, instead of taking part with their fellow-citizens in the election of representatives to the German parliament at Frankfort, the leading promoters of Panslavism summoned a Slavonic congress at Prague, which was attended by Slavonians from Bohemia, Moravia, and Silesia, and by Slavonic Poles, Croats, Servians, and Dalmatians, who appeared in their national costumes. The impracticability of the grand schemes promulgated in the manifestoes of the conclave had been sufficiently shown ere the congress was interrupted by a democratic rebellion, which was suppressed with much bloodshed. Since 1860, when questions of nationality began to come more into the foreground, Panslavism has exercised some direct influence on Austrian affairs: both northern and southern Slavs tending toward united action in opposition to the centralistic and dualistic aims of Germans and Magyars respectively. In 1867 a great Slavonic congress was held at Moscow without result. Panslavistic tendencies contributed to the great changes that took place in 1877–78 in the Balkan peninsula P. was favored by the late Gen. Skobeleff.

PANSY. See VIOLET.

PANT'AGRAPH (Gr. *panta*, all, *graphein*, to delineate), an instrument by the aid of which any engraving may be copied on paper, though its use is in practice restricted to the copying of maps and plans. The copy can be drawn to any scale. The instrument consists of four rods, AB, AC, DF, and EF, jointed together, as in the figure; the points D and E are so taken that AD is equal to EF, and AE to DF, and consequently ADEF is always a parallelogram. If C be a determinate point near the end of the rod AE, and any line, CHB, be drawn cutting the other three rods, the triangles BAC and BDH are similar; so that when the point B is fixed, the points C and H, which can, from the structure of the instrument, move in any direction, will describe similar figures different in size; that described by C being to that described by H in the proportion of CB to HB. The practical working of the instrument is as follows: The points H and B are determined by the ratio BH to BC, which is the proportion the scale of the copy bears to that of the original; a socket, which slides along the arm, is fastened exactly at B on the under side; below this is placed a heavy weight, with a stalk fitting into the socket, thus rendering B the center of motion of the instrument, if the weight be heavy enough. A pencil is fitted into another socket at H, and a rod of metal with a sharp point, called the *tracer*, is fastened at C, and the instrument is fitted with castors at various points underneath, to allow of its being moved freely. The operator then passes the tracer over the outline to be copied, and simultaneously the pencil at H makes the copy on the required scale. If a copy on a scale nearly as large as the original be required, the fulcrum must be placed in DF, and the pencil in DB; while, if a magnified copy be required, the pencil and tracer must exchange the positions assigned them in the first case. The defects of this instrument are its weight and the difficulty of rendering it perfectly mobile, both of which prevent that steady motion of the tracer which is necessary for making an accurate copy.



To remedy these defects, the pantagraph has been constructed in a variety of forms, all of which, however, like the one described, depend upon the principle that the two triangles which have for their angular points, the fulcrum the pencil-point and a joint, and the fulcrum the tracer-point and a joint, must always preserve their similarity.

PANTELLE'RIA, a volcanic island in the Mediterranean, area, 58 sq. m. and lying 62 m. s.w. of the Sicilian coast. The chief products are wine, oil, cotton, and fruit. There are many mineral springs. Pop. 7178.

PANTHAYS, a Mohammedan community occupying the province of Yun-nan in the s.w. of China, who asserted their independence in 1855. In 1859 they captured Talifoo, the second city of the province, and in 1858, the capital. Their leader Wen-soai (king Suleiman) established his authority over about 4,000,000 of people, of whom not above a tenth were Mohammedans. In 1866 the Chinese government recognized the independence of the Panthays, and in 1872 their king sent his son Hassan on a mission to Europe. Meanwhile the Chinese again attacked the Panthays, defeated them utterly, and finally suppressed their empire. Panthays is an anglicized form of *Pan-si*, the name by which the Mohammedans called themselves.

PANTHEISM (Gr. *pan*, all, and *theos*, God), the name given to that system of speculations which in its spiritual form, identifies the universe with God (*akosmism*), and, in its more material form, God with the universe. It is only the latter kind of pantheism that is logically open to the accusation of atheism (q.v.); the former has often been the expression of a profound religiosity. The antiquity of pantheism is undoubtedly great, for it is prevalent in the oldest known civilization in the world—the Hindu. Yet it is a later development of thought than polytheism (q.v.), the natural instinctive creed of primitive races, and most probably originated in the attempt to divest the popular system of its grosser features, and to give it a form that would satisfy the requirements of philosophical speculation. Hindu pantheism, as *akosmism*, is taught, especially by the Upanishads (q.v.), the Vedânta (q.v.), and Yoga (q.v.) philosophies, and by those poetical works which embody the doctrines of these systems; for instance, the Bhagavagîtâ, which follows the Yoga doctrine. It is poetical and religious, rather than scientific, at least in its phraseology; but it is substantially similar to the more logical forms developed in Europe. The Hindu thinker regards man as born into a world of illusions and entanglements, from which his great aim should be to deliver himself. Neither sense, nor reason, however, is capable of helping him; only through long-continued, rigorous, and holy contemplation of the supreme unity (Brahma) can he become emancipated from the deceptive influence of phenomena, and fit to apprehend that he and they are alike but evanescent modes of existence assumed by that infinite, eternal, and unchangeable spirit who is all in all. Hindu pantheism is thus purely spiritual in its character; matter and (finite) mind are both alike absorbed in the fathomless abyss of illimitable and absolute being.

Greek pantheism, though it doubtless originated in the same way as that of India, is at once more varied in its form, and more ratiocinative in its method of exposition. The philosophy of Anaximander (q.v.), the Milesian, may almost, with equal accuracy, be described as a system of atheistic physics or of materialistic pantheism. Its leading idea is, that from the infinite or indeterminate (*to apeiron*), which is "one yet all," proceed the entire phenomena of the universe, and to it they return. Xenophanes (q.v.), however, the founder of the Eleatic school, and author of the famous metaphysical *mot*, *Ex nihilo, nihil fit*, is the first classical thinker who promulgated the higher or idealistic form of pantheism. Denying the possibility of creation, he argued that there exists only an eternal, infinite one or all, of which individual objects and existences are merely illusory modes of representation; but as Aristotle finely expresses it—and it is this last conception which gives to the pantheism of Xenophanes its distinctive character—"casting his eyes wistfully upon the whole heaven, he pronounced that unity to be *God*." Heracleitus (q.v.), who flourished a century later, reverted to the material pantheism of the Ionic school, and appears to have held that the "all" first arrives at consciousness in man, whereas Xenophanes attributed to the same universal entity, intelligence, and self-existence, denying it only personality. But it is often extremely difficult, if not impossible, to draw or to see the distinction between the pantheism of the earlier Greek philosophers and sheer atheism. In general, however, we may affirm that the pantheism of the Eleatic school was penetrated by a religious sentiment, and tended to absorb the world in God, while that of the Ionic school was thoroughly materialistic, tended to absorb God in the world, and differed from atheism rather in name than in fact. But the most decided and the most spiritual representatives of this philosophy among the Greeks were the so-called "Alexandrian" *Neoplatonists* (q.v.), in whom we see clearly, for the first time, the influence of the east upon Greek thought. The doctrines of emanation, of ecstasy, expounded by Plotinus (q.v.), and Proclus (q.v.), no less than the fantastic Dæmonism of Iamblichus (q.v.) point to Persia and India as their birthplace, and in fact differ from the mystic teaching of the Vedanta only by being presented in a more logical and intelligible form, and divested of the peculiar mythological allusions in which the philosophy of the latter is sometimes dressed up.

During the middle ages, speculation was, for the most part, held in with tight reins by the church, and in consequence we hear little of pantheism. Almost the only philosopher who advocated, or who even seems to have thought about it, is John Scotus Erigena (see ERIGENA), who was probably led to it by his study of the Alexandrians, but his speculations do not appear to have been thought by him incompatible with a Christian faith; and in point of fact there are several profoundly mystical expressions

employed in the New Testament, especially in the epistles of John, in which the soaring spiritualism of Christianity culminates in language that has at least a pantheistic form; e.g., "God is love; and he that dwelleth in love dwelleth in God, and God in him." Erigena is regarded as the link that unites ancient and modern pantheism. We find him now a reflection of the east and of Greece, and now a foreshadowing of the doctrines of Schelling and Hegel. His opinions were, with some scholastic modifications, introduced, in the 12th and 13th centuries, into theology by Amalric or Amaury de Chartres (a disciple also of Abelard), and his pupil David de Dinant, who were condemned as heretics by a council held at Paris.

Modern pantheism first shows itself in Giordano Bruno (q.v.), burned at Rome for his opinions in 1600. In Bruno reappear the speculations of the Eleatics and of the Neoplatonists, but with a still more definite recognition than we meet with in them of an absolutely perfect supreme spirit. The universe, in the eyes of the unfortunate Italian, is not, properly speaking, a creation, but only an emanation of the infinite mind—the eternal expression of its infinite activity; and hence the infinite mind penetrates and fills, with different degrees of consciousness, all the heights and depths of the universe. To see God everywhere, to realize that he alone is, and that all else is but a perishable phenomenon or passing illusion—that there is but *one* intelligence in God, man, beast, and what we call matter—this should be the aim of all true philosophy. Spinoza (q.v.) comes next among pantheists in the order of time, but he is perhaps the greatest, certainly the most rigorous and precise, of the whole class that either the ancient or the modern world has seen. His system is based, like the geometry of Euclid, on certain definitions and axioms, and he claims to have given it as conclusive and mathematical a demonstration as the latter. None will deny the keenness and cogency of his ratiocination. But human beings will not be forced into pantheistic convictions by any mere logical goad, however sharp; and the system, impregnable as it seems, has never had a formal adherent. The principal result at which, after a long, firm-linked chain of reasoning, Spinoza arrives, is, that there is but one substance, infinite, self-existent, eternal, necessary, simple, and indivisible, of which all else are but the modes. This substance is the self-existent God. To call Spinoza an atheist is ridiculous. The extravagant phrase of Schleiermacher, "a God-intoxicated man" (*ein Gott-trunkener mann*), would be greatly nearer the truth, for no human system of philosophy whatever exhibits such an all-controlling and even overwhelming sense of the omnipresent God. Many critics have said that he was far more of an old Hebrew in his system than he dreamed. Although he had no direct followers, he exercised great influence on the development of metaphysical speculation in Germany, where, with the exception of Kant (q.v.), the three greatest philosophers of recent times—Fichte (q.v.), Schelling (q.v), and Hegel (q.v.)—have all promulgated systems of a thoroughly pantheistic and ideal character. Neither England, France, nor America has produced a single great pantheistic philosopher (unless Mr. Emerson be regarded as such); but there is an immense amount of pantheistic sentiment floating about in the poetry, criticism, theology, and even in the speculative thinking, in these and all European countries in the present age. This is attributable to the ravages made by biblical criticism, and the progress of the physical sciences in the region of religious beliefs. Multitudes of men are puzzled what to think and what to believe. They do not like to face the fact that they have actually lost faith in revelation, and are no longer relying for help and guidance on the spirit of God, but on the laws of nature; so they take refuge from the abhorred aspect of the naked truth, that they are "atheists," in a cloud of rose-colored poetical phrases, which, if they mean anything, mean pantheism.

PANTHEON, a Greek or Roman temple dedicated to all the gods. The "pantheon" of Rome, now the church of Santa Maria Rotonda, is the only ancient edifice in Rome that has been perfectly preserved. The pantheon is lighted through one aperture in the center of its magnificent dome. It was erected by Agrippa, son-in-law of Augustus, 27 B.C. The name is also given to the Church of St. Geneviève in Paris, ordered by the National Assembly in 1791, to be used as a temple to perpetuate the memory of illustrious Frenchmen. See illus. Domes.

PANTHER, *Felis pardus,* one of the largest *felidæ,* now supposed to be identical with the leopard (q.v.), or a mere variety of it, differing only in its larger size and deeper color. Cuvier distinguishes the panther from the leopard, but without stating any characters other than those of color. The name panther (vulg. "painter") is given to the puma (q.v.) in America.

PANTICAPÆUM. See Kertch.

PANTOMIME, among the ancient Romans, denoted not a spectacle but a person. The pantomimes were a class of actors who (as the name implies) acted not by speaking, but wholly by mimicry—gesture, movements, and posturings—corresponding therefore pretty closely to the modern ballet-dancers. When they first made their appearance in Rome cannot be ascertained; probably the *histriones* (Etrusc. *hister,* a dancer) brought from Etruria to Rome 364 B.C. were pantomimes; but the name does not once occur during the republic, though it is common enough from the very dawn of the empire. Augustus showed great favor to this class of performers, and is consequently supposed

by some writers to have been himself the inventor of the art of dumb acting. The most celebrated pantomimes of the Augustan age were Bathyllus (a freedman of Mæcenas), Pylades, and Hylas. The class soon spread over all Italy and the provinces, and became so popular with the Roman nobles and knights (who used to invite male and female performers to their houses to entertain their guests), that Tiberius reckoned it necessary to administer a check to their vanity, by issuing a decree forbidding the aristocracy to frequent their houses, or to be seen walking with them in the streets. Under Caligula they were again received into the imperial favor; and Nero, who carried every unworthy weakness and vice to the extremity of caricature, himself acted as a pantomime. From this period they enjoyed uninterrupted popularity as long as paganism held sway in the empire.

As the pantomimes wore masks, no facial mimicry was possible; everything depended on the movements of the body. It was the hands and fingers chiefly that spoke; hence the expressions, *manus loquacissimæ, digiti clamosi*, etc. To such perfection was this art carried, that it is said the pantomimes could give a finer and more precise expression to passion and action than the poets themselves. The subjects thus represented in dumb show were always mythological, and consequently pretty well known to the spectators. The dress of the actors was made to reveal, and not to conceal, the beauties of their person; and as, after the 2d c., women began to appear in public as pantomimes, the effect, as may easily be supposed, of the æsthetical costume was injurious to morality. Sometimes these pantomimic actresses even appeared quite naked before an audience—a thing which could never have happened had the Roman communities not become thoroughly base, sensual, and impure. It was quite natural, therefore, that pantomimic exhibitions should have been denounced by the early Christian writers, as they even were by pagan moralists like Juvenal.

Under HARLEQUIN is described the character of the modern pantomimes, which word denotes not the performers, but the pieces performed. A few additional facts are here given to complete that notice. The Christmas pantomime, or harlequinade, is in its present shape, originally a British entertainment, and was first introduced into that country by a dancing-master, of Shrewsbury, named Weaver, in 1702. One of his pantomimes, entitled *The Loves of Mars and Venus*, met with great success. The arrival, in the year 1717, in London of a troupe of French pantomimists with performing dogs gave an impetus to this kind of drama, which was further developed in 1758 by the arrival of the Grimaldi family, the head of which was a posture-master and dentist. Under the auspices of this family, the art of producing pantomimes was greatly cultivated, and the entertainment much relished. Joseph Grimaldi, the son of the dentist, was clever at inventing tricks and devising machinery, and *Mother Goose*, and others of his harlequinades, had an extended run. At that time the wit of the clown was the great feature; but by and by, as good clowns became scarce, other adjuncts were supplied, such as panoramas or dioramic views; and now the chief reliance of the manager is on scenic effects, large sums of money being lavished on the *mise en scene*. This is particularly the case as regards the transformation scene—i.e., the scene where the characters are changed into clown, harlequin, etc.—as much as £1000 being frequently spent on this one effort. In London alone, a sum of about £40,000 is annually expended at Christmas time on pantomimes. The *King of the Peacocks*, a pantomime produced at the London Lyceum theater during the management of Mme. Vestris, cost upwards of £3000. Some very elaborate pantomimes have been presented in this country, the most popular of them being *Humpty-Dumpty*, with George L. Fox as clown, and *Excelsior*, given by the Kiralfys.

PA'OLI, PASCAL, a famous Corsican patriot, was born in 1726 at Morosaglia, in Corsica. His father, having taken a leading part in the unsuccessful insurrection of the islanders against the Genoese and their French allies, was obliged to return to Naples in 1739, taking his son with him. Here Paoli received an excellent education. In July, 1755, he was summoned by the supreme magistracy to Corsica, and was elected capt.gen. of the island, and the chief of a democratic government, possessing all the power of a king, but without the title. He energetically and successfully applied himself to the reformation of the barbarous laws and customs of the island, and at the same time to the expulsion of the Genoese, who, notwithstanding the aid they received from an influential section of the islanders, were deprived of nearly all their strongholds, their fleet was defeated, and they were finally obliged to seek help from France. After the withdrawal of the French troops, they were again speedily deprived of the places they had recaptured, and in 1768 they ceded the island to France. Paoli refused all the advantageous offers by which the French government sought to bribe him, as he had before refused those of the Genoese, and continued to struggle for the independence of his country, but he was signally defeated by the comte de Vaux, at the head of the French troops, and the French became masters of the island. After one year's struggle, Paoli was compelled to take refuge on board of a British frigate, in which he sailed for England, where he was treated with general sympathy. Twenty years afterwards, the French revolution of 1789 recalled him to Corsica, and as a zealous republican he entered into the schemes of the revolutionary party; but during the anarchy of France in 1792–93 he conceived a scheme for making Corsica an independent republic. Until this time he had been on the best terms with the Bonaparte family, but they now joined the Jacobin party whilst he allied himself with Britain, favored the landing of 2,000 British troops

in the island in 1794, and joined them in driving out the French. He then surrendered the island to George III., but becoming dissatisfied with the government, he quarreled with the British viceroy, whilst many of his countrymen were displeased with the course he had adopted in allying himself with the British. He therefore retired from the island in 1796, and spent the remainder of his life in the neighborhood of London. Paoli died near London, Feb. 5, 1807.

PAOLO, Fra, or Paoli Sarpi. See Sarpi.

PAOLO, Veronese. See Cagliari Paolo.

PA'PA, a large market t. in the w. of Hungary, stands in a beautiful district on the Tapolcza, an affluent of the Marczal, 59 m. s.e. of Presburg. Pop. '90, 14,261.

PAPA, the Latin form of the title now, in the western church, given exclusively to the bishop of Rome. Originally, however, meaning simply "father," it was given indiscriminately to all bishops. Tertullian (*De Pudicitia,* cxiii.) so employs it. Dionysius, a priest of Alexandria, calls his bishop Papa Heraclias. St. Cyprian, in the letters of his clergy, is addressed *beatissimo papæ Cyprano.* The same form is employed towards him by the clergy of Rome itself. Even Arius so addresses his own bishop Alexander. In the next century, St. Jerome addresses the same title to Athanasius, to Epiphanius, and most of all to Augustine. Indeed it would appear certain that down to the time of Gregory of Tours it was used not uncommonly of bishops in the western church. And there are evidences of its being occasionally applied to the inferior clergy, for whom, however, some adjunct was employed, in order to distinguish them from bishops. Thus we sometimes read of *papæ pisinni,* minor popes; and the tonsure was called by the name of *papa letra.*

PA'PACY. See Popes.

PAPAGOS, an Indian tribe of the Pima family living in Arizona, where they occupy a reservation of 70,000 acres on the Santa Cruz river, allotted them in 1874. In the early history of the country they were friendly to the Spaniards, who established missions among them, at first under the control of the Jesuits, and, on the suppression of that order, under that of the Franciscans. They expelled the Spanish in 1694, but peace was soon made between them, and the tribe has remained Roman Catholic. They were long at war with the Apaches, with whom they made peace only a few years ago; and they suffered much from their attacks about 1820. When Arizona was annexed to the United States they were actually citizens of Mexico; but their rights were not recognized, and settlements were made upon their land without any attempt to secure a cession by treaty. They now number about 5000.

PAPAL GUARANTEES. The provisions of a bill passed by the Italian Parliament, May 3, 1871, guaranteeing the prerogative of the Pope, and settling the relation of Italy to the Church. The person of the Pope is pronounced sacred and inviolable; offenses against his person are placed on a level with those committed against the King; royal honors are accorded him, with liberty to maintain an unlimited number of guards about him; the palace of the Lateran, and of the Vatican, and the Castel Gaudolfo, remain his free possession; his yearly dotation is fixed at 3,225,000 lire ($6,445,000); and all ecclesiastical institutes are declared to be subject to his authority alone. The Papal Guarantees were enacted in the hope of reconciling the Pope to the occupation of the city of Rome by the Italian troops (1870) and its subsequent annexation to the Kingdom of Italy. The Papal authorities, however, have never recognized them, and the dotation has never been accepted by the Pope, who depends upon the revenue known as "Peter Pence" (q.v.) to defray the expenses of his State. See Italy.

PAPAL INFALLIBILITY. See Infallibility.

PAPAL STATES (Italian, Stati della Chiesa, or Stati Pontifici), a territory, or rather group of states in central Italy, formerly united into one sovereignty, with the pope for its head. It was of an irregular form, resembling the letter Z, the upper portion lying to the e. of the Apennines, the lower to the w. of that range, these two being connected by a third strip, which crossed the peninsula from e. to west. The papal states were bounded on the n. by the Po, on the s. by Naples, on the e. by the gulf of Venice and Naples, and on the w. by Modena, Tuscany, and the Tyrrhenian sea. Detached portions, as Benevento and Pontecorvo, lay within the Neapolitan territory. The country is traversed by the Apennines, which attain their highest elevation in the monte della Sibilla, which is about 7,402 ft. above sea-level. Owing to this range, which traverses the peninsula in the direction of its length lying so much nearer the e. than the w. coast, the streams to the e. of it have a short course and little volume, being, in fact, mere mountain torrents; while on the w. side a few of the rivers are of considerable size. Of the latter the Tiber (q.v.) is the largest. The eastern coast is bold and rugged, and destitute of proper harbors, that of Ancona alone excepted; towards the n., at the mouth of the Po, it gradually subsides into a low, level, marshy tract, with numerous lagunes. The country w. of the Apennines is traversed by ranges of hills parallel to them, and gradually decreasing in elevation as they approach the sea. The coast itself is almost wholly flat, sandy, or marshy, with no deep bays and few good harbors besides Civita Vecchia. There are numerous small lakes, principally in the northern portion of the country, the chief of which are lake Bolsena, lake Perugia, and lake Bracciano, the last an old crater, situated almost 1000 ft. above sea-level.

The country was divided for administrative purposes into 20 districts, as follows: 1

Comarca, including Rome and the Argo Romano; 6 legations, Bologna, Ferrara, Forli, Ravenna, Urbino, Velletri; and 13 delegations, Ancona, Ascoli, Benevento, Camerino, Civita Vecchia, Fermo, Frosinone, Macerata, Orvieto, Perugia, Spoleto, Rieti, Viterbo; with a total area of 15,774 English sq.m., and a population of above 3,000,000. The legations of Bologna, Ferrara, Forli, and Ravenna constituted the *Romagna;* Spoleto and Perugia were known as *Umbria;* and Ancona, Fermo, Macerata, and Ascoli constituted the *March of Ancona.* The inhabitants, with the exception of 16,000 Jews, were of Italian race, and of the Roman Catholic religion. The only provinces which latterly remained under the papal rule were, Rome with the Comarca, the legation of Velletri, and the delegations of Civita Vecchia, Frosinone (excepting Pontecorvo), and Viterbo, with a total area of 4,493 English sq.m., and a population of about 700,000. The chief cities and towns in the territory were, Rome (the capital), Viterbo, Velletri, Alatri, and Civita Vecchia.

Climate and Products.—The climate of the papal states is one of the finest in the world, and the heat of summer is tempered by the mild and cooling sea breezes; but in the flats s. of the Po and in the campagna of Rome, the noxious atmosphere produced by the exhalations from the marshes is most destructive of human life. Fever and ague are very prevalent among the inhabitants of the neighboring districts, and notwithstanding the attempts to remedy the deadly influence of the marshes by drainage and cultivation, it has hitherto been undiminished (see MAREMMA). Violent siroccos are occasionally experienced on the w. coast. The northern portion, from its elevation, is exposed to severe cold during winter. The soil of the papal states is in general extremely fertile; but the higher mountain districts are either quite barren, or only adapted for pasture; and not more than one-third of the whole surface is under cultivation. The practice of agriculture is in its most primitive state, notwithstanding the fact that agriculture, as a science, originated here, and was practiced for many centuries before it was introduced into the other countries of Europe; but the many political changes and revolutions which have convulsed the country, have acted as a bar to all enterprise. It must, however, be mentioned, that the present pope has, by salutary enactments, and by the establishment of agricultural societies, done much for the improvement of this branch of industry. The products are similar to those of the rest of Italy. The manufactures are comparatively unimportant—silks, woolens, and leather are the chief; but plate-glass, rope, sail-cloth, cotton goods, paper, artificial flowers, wax-candles, soap, stoneware, etc., are also manufactured in various places. The fisheries are important. The chief minerals are alum, vitriol, saltpeter, sulphur, coal, rock-salt, marble, and alabaster.

Many of the manufactured goods, and wine, olive oil, wool, hemp, tobacco, breadstuffs, catgut, etc., were exported, the total exports amounting to about $13,000,000, while the imports reached nearly $70,000,000. The statistics were latterly very unreliable, but the fact that the papal states are now no more, renders details of trade under pontifical rule a matter of little importance. Indeed, no information on such topics was issued under the latest years of the political power of the pope.

Government.—The pope possessed absolute and unlimited power, but the members of the college of cardinals, who elected him, generally kept the chief offices of state in their own hands, and assisted the pope in the government of his states, as well as in the affairs of the church. The secretary of state was at the head of political affairs, and was nominated by the pope. He presided over both the ministerial council and the council of state. The former council, which consisted of five or more ministers, heads of departments, selected by the pope, had a voice in legislation, and also the right of authoritative interpretation of the laws; the latter, which consisted of 13 members, also nominated by the pope, had, in matters of legislation and finance, only the right of giving advice; but it settled any question of competency that might arise between the various branches of the administration. After 1850 there was also a separate *finanz-consulta* for the regulation of financial affairs. The Comarca, which was more directly under the central government, was ruled by a cardinal-president; the legation was ruled by a cardinal-legate, aided by a provincial chamber of deputies. There were civil and criminal courts in all the provinces, minor courts in the communes, with courts of appeal in all the chief cities, and a central tribunal at Rome. All the proceedings of these courts were public, except trials for political offenses.

The papal army, which formerly amounted to 20,000 men, in June, 1863, numbered only 8,513 men, infantry, cavalry, artillery, etc., included, and a considerable portion of the papal territory was garrisoned by French troops, without whose aid the pope's power could not have been maintained.

The income and expenditure for 1859, the last year of the entirety of the papal states, were respectively 14,453,325 scudi ($15,630,140), and 15,019,346 scudi ($17,240,190); but the three succeeding years showed a widely different result, the expenses being largely increased by the cost of the war, while from the rebellious provinces scarcely any taxes were collected. The income and expenditure for these three years were nearly as follows:

	Expenditure.	Income.
1860	$23,604,045	$8,583,290
1861	21,458,220	8,583,290
1862	10,729,110	5,364,555

The finances continued in the same deplorable condition, and the national debt amounted to about $85,000,000. The tax known as "Peter's pence," which was collected from all the Roman Catholic countries, had produced at the beginning of 1863 about $5,400,000.

History.—During the rule of the Goths and Lombards in Italy, the inhabitants of Rome and all who desired to live free from the barbarian yoke, feeling that the Greek empire was incapable of protecting them, and at the same time observing the pertinacity and energy with which the pope asserted the importance and dignity of Rome, naturally looked up to him as in some sort a protector; and it is to the gradual growth and spread of this feeling that the important position subsequently taken by the popes as authorities in temporal matters is chiefly due. About 720 A.D., Gregory III., having quarreled with the emperor Leo the Isaurian, declared the independence of Rome. In 726 Pepin le Bref compelled the Lombard king to hand over Ravenna, Rimini, Pesaro, Fano, Cesena, Urbino, Forli, Comacchio, and 15 other towns, to the pope, who now assumed the state of a temporal sovereign. Pepin's example was followed by his son Charlemagne; but, notwithstanding, the pope's sovereignty was more nominal than real, as the towns were not in his possession, and he only obtained a small share of their revenues. In the 11th c. the Normans greatly aided to increase the papal temporal authority, and in 1053 the duchy of Benevento was annexed. In 1102 the countess Matilda of Tuscany left to the pope her fiefs of Parma, Mantua, Modena, and Tuscany; but these were immediately seized by the German emperor, and of this magnificent bequest only a few estates came into the pope's hands. Between this period and the end of the 13th c. the popes succeeded, often by unscrupulous means, in obtaining from many of the free towns of Italy an acknowledgment of the superiority of the Roman see over them; and in 1278 the emperor Rudolf I. confirmed the popes in the acquisitions thus obtained, defined authoritatively the boundaries of the papal states, and acknowledged the pope's exclusive authority over them by absolving their inhabitants from their oath of allegiance to the empire. The papal states at this time included Perugia, Bologna, Bertinoro, the duchy of Spoleto, the exarchy of Ravenna, and the march of Ancona; but many of the towns were either republics or hereditary principalities, and in none did the pope possess real authority. Sixtus IV., in the end of the 15th c., managed to annex the Romagna to his dominions; in effecting which he is accused of having employed intrigue, perjury, and murder. His successors, Alexander VI. and Julius II., increased the papal states by the addition of Pesaro, Rimini, Faenza, Parma, Placentia, and Reggio. By the victory of the French at Marignan (1515), the very existence of the papal power was threatened; but the able policy of Leo X. averted the threatened danger. In 1545 Paul III. alienated Parma and Placentia, and erected them into a duchy for his son, Pietro Luigi Farnese; but this loss was partly made up by the acquisitions of Gregory XIII. In 1598 the possessions of the house of Este, viz., Ferrara, Comacchio, and a part of the Romagna, were seized by pope Clement VIII.; and the papal states received their final additions in Urbino (1623), Ronciglione, and the duchy of Castro (1650). The Romagna was seized by Napoleon in 1797, and incorporated in the Cisalpine republic; and in the following year Rome was taken by the French, and the papal states erected into the *Roman republic.* Pius VII., in 1800, obtained possession of his states, but they were almost immediately retaken by the French, and finally (1809) incorporated with France, Rome being reckoned the second city of the empire. In 1814 the pope returned to his dominions, and was formally reinstated by the treaty of Vienna, mainly through the exertions of the *non-Roman Catholic* powers, Russia, Prussia, and Britain; but the clerical misgovernment contrasted so strongly with the liberal administration of France that in 1830 the people of Ancona and Bologna rose in rebellion. They were put down by the aid of an Austrian army, but the abuses in the administration were so flagrant that even Austria urged the necessity for reform. Her remonstrances, however, were not attended to, and the Bolognese again rebelled. This second revolt supplied Austria with a pretext for occupying the northern legations, and the French at the same time garrisoned Ancona. Occasional risings took place from time to time up to 1846, when the late pope, Pius IX., assumed the tiara, and burst upon the astonished world in the new character of a reforming pope. His projects were of a most liberal character, and were put in force with great energy, despite the opposition of Austria; but, alarmed at the spread of revolution in Europe during 1848, he halted in his career, just at the critical moment when to halt was to be lost. The people rose, and Pius IX. fled to Gaeta, whilst Rome was proclaimed a republic. He was restored, and his subjects reduced to submission by the arms of France, Austria, Naples, and Spain. The Austrians held the legations in subjection to the pope's authority till 1859; and the French occupied Rome in his behalf for 10 years more. In July, 1859, the four northern legations (the Romagna), taking advantage of the withdrawal of the Austrian troops, quietly threw off the papal authority, and proclaimed their annexation to Sardinia, which was formally acknowledged by Victor Emmanuel in Mar., 1860. The pope now raised a large body of troops, appointing Lamoricière, an eminent French gen., to command them, for the purpose of resisting any further encroachments on his dominions; but the news of Garibaldi's success in Sicily and Naples produced revolt in the legation of Urbino and in the marches, the people proclaiming Victor Emmanuel. The Sardinians accordingly marched into the papal states, defeated Lamoricière in two encounters, and finally compelled him to retire into Ancona, where, after a siege of seven days, he

was compelled to surrender with his whole army. The revolted provinces of Umbria, Urbino, and the marches were immediately annexed to Sardinia; and the isolated provinces of Benevento and Pontecorvo (a part of Frosinone), which were situated within the kingdom of Naples, shared the same fate. In Oct., 1870, the French having withdrawn, the remnant of the papal states voted for annexation to the kingdom of Italy. For coat-of-arms, see illus., HERALDRY, vol. VII.

PAPAVERA'CEÆ, a natural order of exogenous plants, herbaceous or half shrubby, usually with a milky or colored juice. The leaves are alternate, without stipules; the flowers on long one-flowered stalks. The fruit is pod-shaped or capsular; the seeds numerous. The order is distinguished for narcotic properties. Opium (q.v.) is its most important product. The juice of Celandine (q.v.) is very acrid. A number of species are used in their native countries for medicinal purposes. The seeds yield fixed oil, which, with the exception of that obtained from *Argemone Mexicana*, is quite bland. See POPPY. The flowers of many species are large and showy, most frequently white or yellow, sometimes red. Several kinds of poppy and eschscholtzia are frequent in our gardens. There are in all about 130 known species, natives of all quarters of the world, and of tropical and temperate climates, but they abound most of all in Europe.

PAPAW', *Carica Papaya*, a South American tree of the natural order *Papayaceæ*—of which order about 30 species are known—which has now been introduced into many tropical and subtropical countries. It grows to the height of 15—30 ft., with leaves only at the top, where also the fruit grows close to the stem. The leaves are 20—30 in. long. The fruit is of a green color, very similar in appearance to a small melon, and with a somewhat similar flavor. It is eaten either raw or boiled. The seeds are round and black, and when chewed, have in a high degree the pungency of cresses. The powdered seeds and the juice of the unripe fruit are most powerful anthelmintics. A constituent of this juice is *fibrine*, otherwise unknown in the vegetable kingdom, except in the fungi. The milky juice of the tree is very acrid. The leaves are used by negroes instead of soap to wash linen. The juice of the fruit and the sap of the tree have the singular property of rendering the toughest meat tender in a short time. Even the exhalations from the tree have this property; and joints of meat, fowls, etc., are hung among its branches to prepare them for the table. It is a tree of extremely rapid growth, bears fruit all the year, and is exceedingly prolific. The fruit is often cooked in various ways. The *Chamburu* (*C. digitata*), another species of the same genus, a native of Brazil, is remarkable for the extremely acrid and poisonous character of its juice, and the disgusting stercoraceous odor of its flowers. In the middle and southern states of America the name papaw is given to the *Uvaria* (or *Asimina*) *triloba*, a small tree of the natural order *Anonaceæ*, the fruit of which, a large oval berry, 3 in. long, is eaten by negroes, but not generally relished by others. All parts of the plant have a rank smell.

PAPENBURG, a small t. of Prussia, in the province of Hanover, on a canal navigable for sea-going vessels, 22 m. s.e. of Emden, on Dollart bay, by the Emden and Hanover railway. It originated in a small colony which sprung up here, and was supported principally by peat-cutting, an employment for which the fens and moors of the vicinity afford abundant facilities. The town is cleanly built, after the Dutch model; its houses stretch along the banks of the canal. It carries on manufactures of sail-cloth and ropes. Its commerce is considerable. Pop. '90, 6933.

PAPER. The date of the origin of paper is not well authenticated, but the Egyptians, so far as is known, were the first to make it, separating the layers of the papyrus plant, which has a cellular flower stem, and using the thin tissues. These tissues were separated from each other by using a sharp-pointed instrument, and then after being wet in Nile water were spread on boards to dry, the edges overlapping each other. A second layer was placed transversely upon the first and then subjected to pressure, and after this process it was polished by continuous rubbing with a shell or some hard and smooth substance. This method dates back to a period long before the Christian era, some accounts stating as early as 2500 B.C. In the time of the Romans many varieties were known, which differed as to the quality of the material and the size of the pieces of which the sheets were composed. The finest quality was called *hieratica*, or paper of the priests. This was made for the Egyptian priests, who interdicted its sale until covered with sacred writing. In this state, it was, however, an article of trade, and the Romans found a means of removing the writing, and sold the palimpsest sheets in Rome under the name of *Augustus* paper, used as a Latin equivalent for its former Greek name of *hieratica*. It was, however, supposed by many that it was named after the emperor Augustus, and in consequence a second quality was called after his wife, *Livinia;* and the original name of the first quality came in time to be applied to the third quality. The next quality was called *Amphitheatrica*, it is supposed from its having been made in the vicinity of the Alexandrian amphitheater. This last, when imported to Rome, was partly remanufactured by Q. Remmius Fannius Palæmon, the school-master and paper-maker who, by a peculiar process of his own, reduced its thickness and rendered it equal to the first quality, when it was sold under the name of *Fanniana*. There were other inferior qualities, of which one, called *Emporetica*, was used as shop paper.

Pliny tells us that all these kinds were manufactured in Egypt, and required the Nile

water for their formation. He says that, "When it is in a muddy state it has the peculiar qualities of glue, and the various kinds of paper are made on a table where they are moistened with this water. The leaves or sheets are laid upon it lengthwise, as long, indeed, as the papyrus will admit of, the jagged edges being cut off at either end; after which a cross layer is placed over—the same way, in fact, that hurdles are made. When this is done, the leaves are pressed together and dried in the sun." The idea of the adhesive quality of the Nile water is erroneous, but it is very probable the Egyptian manufacturers encouraged the error. It is obvious the whole merit consisted in using the layers fresh, while their own natural gum was in proper condition to make them adhere together.

In India and China, the art of writing with a style or sharp point upon dried palm and other leaves, and also some kinds of bark, is common even at the present day, especially in Ceylon, where we find it common to employ the leaves of the talipat and other palms as paper. Perhaps it was from the employment of these materials, or it is even possible from watching the operations of the paper making wasps and other insects, that the manufacture of larger pieces, by pulping the materials and spreading them out to a greater extent, was suggested. At Memphis there are accounts of manuscripts written 700 B.C. To the Chinese, however, rightfully belongs the credit of the first attempts to make paper of cotton fiber, which embodied the essential features of the paper-making of the present day, their first experiments dating to a period not far from the beginning of the Christian era. Two or three centuries later they were making paper of cotton pulp. Before the discovery of the art of paper-making the ancients wrote upon the dried intestines and skins of animals, upon the leaf of the palm, the wood and bark of trees. The Japanese wrote on silk faced with linen and on thin wood shavings, and used these substances until A.D. 280, when paper began to be imported from Corea. Several centuries later, Taishi, son of the reigning mikado, established the manufacture of a superior kind of paper made from the bark of the mulberry-tree, caused trees to be planted in every part of Japan, and ordered instruction to be given the people in the manufacture of paper. In the 7th c. the Arabians began the manufacture of paper from cotton. Recent investigations of the Fayum collection of Egyptian manuscripts, now deposited in the Imperial library at Vienna, have disclosed a number of valuable documents on the occupation of Egypt by the Arabs, and have shown that as early as 794 a paper factory, under imperial control, was in operation at Bagdad. It also appears that rag paper was manufactured in the East several centuries before the Germans and Italians, who have been credited with being the inventors, knew of its existence. In the same collection the surprising discovery has been made of documents of the nature of religious tracts, for general distribution, printed on papyrus and dating from the 9th and 10th c. The investigations of M. Briquet, a Swiss scholar, published in 1884, prove that linen paper has a much greater antiquity than was formerly supposed. Some ancient documents in the archives of Switzerland were examined under the microscope and found to be on papers consisting entirely of linen or hemp fibers. His conclusion was that the term "cotton paper," used by early writers, referred to some external quality or texture, rather than to composition. Later investigations have established the fact that the use of linen paper long antedates the 11th c.

Some of the earliest known paper money, it has been ascertained, was printed by the Arabs of Northern Syria, at the time of the second crusade in 1147, the quantity becoming so great as to make it in time utterly worthless. The Arabians are supposed to have introduced paper-making into Spain; at a later date the art was carried into France and Holland, and from these countries England imported all its paper up to 1500. In 1498 John Tate built at Hertford the first paper-mill in England, but it was nearly a century later before the art had made much progress. Bohun, in his autobiography, says that in 1685 paper in England was so dear that all printing nearly stopped. The French Protestant refugees, the Huguenots, who in 1690 were driven out of France on the revocation of the Edict of Nantes, made the first white paper in England. The first paper-mill in America was built in 1690 at Roxborough, near Philadelphia, on a small stream still known as Paper-Mill Run, by William Rettinghuysen, since anglicized into Rittenhouse, thus making the art of paper-making in England and America nearly coeval. The second mill was built nearly 20 years later at Credfield, now a part of Germantown, by William de Frees, a connection of Rittenhouse. The first paper-mill in New England was built at Milton, Mass., by a company formed in Jan., 1728, consisting of Daniel Henchman, Gillam Phillips, Benjamin Faneuil, Thomas Hancock, and Henry Deering, to whom, in Sept., 1728, the general court granted the exclusive right for 10 years to manufacture paper in the province of Massachusetts bay. These parties were all Boston men, and Henchman and Hancock were booksellers. Hancock was an uncle of John Hancock, the signer of the Declaration of independence, and Faneuil was the father of Peter Faneuil, who gave Faneuil hall to Boston. The business which they founded passed through different owners to Tileston & Hollingsworth, and by this firm the business has been carried on for nearly 90 years, though its members have represented 3 generations. The second Fourdrinier machine used in this country, imported from Scotland, is still in use in this mill. The first mill built in the Connecticut valley of Massachusetts, which has become the center of the paper-making industry in the U. S., was at Springfield. David Ames, who had been sent by Gen. Washington, during his second administration, from

Bridgewater, Mass., to Springfield, to establish the U. S. armory, subsequently resigned, and in 1800 began the manufacture of paper in a mill which had been built at an earlier date by a Mr. Patten, of Hartford, Conn. The first mill in Berkshire co., Mass., which became noted for the manufacture of fine writing papers, was established at Dalton in 1801 by Henry Wiswall, Zenas Crane, and John Willard. Lee, in the same co., was the first town in the U. S. to gain much notoriety in the manufacture of paper, and its first mill was built in 1801 by Samuel Church.

In magnitude no place in the U. S. equals Holyoke, Mass., in the manufacture of fine paper. Its mills turn out each working day 175 tons, 65 of which are of loft-dried writing papers; and within a radius of 25 m. of Holyoke are made daily over 100 tons of loft-dried writing papers, more than two-thirds of the entire product of the U. S. The first mill in Holyoke was built by Joseph C. Parsons, in 1853, and its product was 2 tons a day, then considered an extraordinary amount. There are now 20 mills, giving employment to 4000 operatives and requiring a capital of $6,000,000.

One-third of the paper made in the world is produced in the U. S., but the business did not attain any considerable importance until 1831, when improved machinery was introduced. David Ames, of Springfield, began business in 1800 and subsequently admitted to partnership his two sons, David and John, who, at a later period, as D. & J. Ames, became the famous paper-makers of New England. John invented, in 1822, the first cylinder machine, previous to which all paper was made by hand by what was known as the dipping process. The cylinder revolved in a vat and was covered with fine wire, which made paper as evenly as by the hand process. In 1830 John Ames also invented the trimming knife, in 1832 a pulp dresser, in 1834 a machine for cutting paper into sheets, and in 1835 succeeded in drying paper by pressing it directly on the cylinder on which it was made. In the same year he improved the method of calendering, the sheets then passing in this process between two rollers only. He multiplied the number of cylinders between which the paper passes in one handling. In 1840 he improved his trimming machine and invented another for stamping.

Of the various improvements in paper-making none have been more important than the invention of the Fourdrinier machine, the joint production of French and English skill. The original inventor appears to have been Louis Roberts, then connected with the mill of Louis Didot, at Essonne, France. He made paper 50 ft. long and 12 ft. wide, and was granted a patent for 15 years and a gratuity of 8000 francs. Subsequently he sold his invention to Leger Didot for 25,000 francs. He was to receive his payments in installments, but Didot failing to meet them, he recovered his patent through a decree of the court in 1801. John Gamble, an Englishman, who was Roberts's brother-in-law, went to London to procure English capital. He took out a patent in England and then induced two wealthy London stationers, Henry and Sealy Fourdrinier, to furnish the necessary money to perfect and bring the machine to the notice of paper-makers. At an engineering establishment at Dartford, in Kent, they found Bryan Donkin, who, after 3 years of labor, produced from the original model a self-acting machine for making an endless web of paper, and this became substantially the Fourdrinier machine of the present day. In 1804 Gamble assigned his patents to the Fourdriniers, having lost in his experiments his fortune and 8 years of labor. The patent was granted for 14 years, from 1801, and in 1807 the Fourdriniers asked that it be extended on account of the great expense they had been to in developing the invention. Lord Lauderdale, who had opposed the extension, while not being able to defeat it, caused to be inserted in the rules of the house of lords a standing order that no extension of patents be granted except to original inventors. This prevented the Fourdriniers from reaping the benefits of their investment, and although they had invested $300,000 to bring the machine to perfection, they were forced into bankruptcy and both died in poverty; Henry in 1855, at the age of 90. Donkin, who confined himself to the manufacture of the machines, appears to have been the only one connected with the invention who reaped substantial benefit. The firm of Donkin & Co., as manufacturers of Fourdrinier machines, became known in every part of the world where fine papers were made. In 1840 nearly 300 of these machines were working in England and Ireland, costing from $3500 to $4000 each. This invention, up to that date, had lowered the price of writing papers fully one-half, and had added $2,000,000 to the revenue of the United Kingdom. Subsequent improvements have been made. George Dickinson, an English paper-maker, in 1828, added the up and down motion to the lateral, not now in use in the U. S., that the pulp might be more evenly distributed over the surface of the wire netting. In 1830 John Wilkes, a partner of Donkin, invented the dandy roll, which facilitates the escape of the water from the web in its progress towards the drying-cylinders. In the same year Thomas Barrett, another Englishman, applied a thin engraved plate to the dandy for making the water-mark. A list of the patents for various devices in the manufacture of paper, taken out in England and in the U. S. since the introduction of the Fourdrinier machine, with the descriptive claims of each, would fill volumes. The greater part of them within recent years have been granted in the U. S.

Formerly the business of paper-making in the U. S. was largely confined to small mills scattered over the country and situated on small streams. Within recent years there has been a tendency to concentrate the business along the larger rivers and in the vicinity of mills already in operation. The increased demand for paper, and the scarcity

of linen and cotton rags, has led to experiments with a great variety of substances, including more than a hundred kinds, such as asparagus, asbestos, aspen, bamboo, bark, blue-grass, broom-corn, Bavarian peat, Brazilian grass, basswood, bagging, banana leaves, cotton waste, corn husks, corn stalks, cocoanut husks, dwarf palm, esparto grass, flax, flag leaves, hop vines, hemp, jute, mulberry, mummy cloth, old sacks, oakum, pine shavings, printed waste, pine, poplar, ropes, saw-dust, spruce-wood, wheat, rye, and oat straw, willow and white-wood. In the U. S. the leading articles entering into paper pulp are cotton and linen rags, poplar and spruce-wood, paper shavings and waste paper. The use of the bark of the mulberry-tree in Japan dates back to an early period. The branches of this tree after having been cut into lengths of a yard are steamed in a straw vessel over a boiler. When the bark begins to loosen it is stripped off by hand and dried in the sun, after which it is put up in bundles of 32 lbs. The next process is to submerge it in running water for 12 hours. The outer husk is scraped off, to be used in the manufacture of an inferior quality of paper, and the inner bark is again placed in running water, after which it is pressed under heavy stones and the fiber boiled with wood ashes. The material is washed for a third time and then after having been thoroughly pounded is molded into balls, which are put into wooden troughs and reduced to a pulp. Next it is mixed with a paste made from the root of the torroro. Some of the pulp is then thrown into a frame having an inner and an outer portion and a false bottom of plaited bamboo, where it rests in such a manner that the water can readily drain off. The sheet of paper is raised from the frame with a piece of bamboo and spread on a drying-board with a brush. The side of the sheet which adheres to the board forms the face of the paper.

The use of wood for making pulp was not common until recent years. Jacob Christian Schaffers, of Ratisbon, Germany, in 1776, published a book containing upwards of 60 specimens of paper made without rags, among the materials used being saw-dust, beech, willow, aspen, mulberry, and pine. The first patent taken out in England for making wood pulp was granted to Watt & Burgess in 1853. The following year they took out a similar patent in the U. S., the first granted in this country. At the instance of a Frenchman named Melier, Elizur Smith, then senior member of the firm of Platner & Smith, and afterward of the Smith paper co., of Lee, Mass., made samples of all-wood paper from basswood, specimens of which are still preserved at the office. This was the first time wood was converted into paper pulp in the U. S. To the Smith paper co. belongs the credit of making and selling the first paper in this country which contained wood pulp. In 1865 Alberto Pagenstecher, who owned the patent of the Voelter grinder, began the manufacture of wood pulp in Stockbridge, Mass., and sold the pulp for 8 cents a lb. to the Smith paper co., who sold the paper into which it entered for 12 cents a lb.

There are two methods of reducing wood to pulp—chemical and mechanical. When the wood is to be treated by chemical action, it is converted into thin chips or shavings. It is then placed in the rotary digester and upon it is poured a liquor made by dissolving soda-ash and lime in water. The wood is then cooked by steam until reduced to a pulp. After this it is washed and bleached, passes into the drainers, and is soon ready for use. Mechanical pulp is prepared by grinding. After the wood is stripped of bark and freed from knots it is sawed into pieces about 16 ins. long, which are placed in close iron boxes, inclined towards a grindstone. By constant mechanical pressure the wood is forced down the incline, the sides of the sticks are pressed against the face of the grindstone, and the wood is quickly reduced to fiber. A spray of water carries off the fibrilized pulp to the stuff-chest in the basement. It is then pumped into a vat, from which it is taken by a revolving cylinder, and, passing to the felt, is carried along in a steady flow to a point where it passes between 2 heavy rollers. It adheres to the upper roller and when of sufficient thickness is cut off by a knife attached to the machine for that purpose. It is then folded into sheets 14 by 26 ins. and placed on scales, where it remains until its weight is 100 lbs. Then it is pressed and tied into compact bundles and shipped to the paper-mill to be converted into paper, or is used in mills connected with the pulp-mill. Newspaper made from mechanically reduced pulp contains 75 per cent. of wood; that made by the chemical process often as high as 90 per cent. Book and even some grades of writing papers are now largely made of chemically reduced wood. A method of bleaching paper pulp by electricity was invented by an American in 1888.

The process of making paper differs in some minor details in different mills—the kind of machine in use, and the varieties of stock, and the kind of paper to be made, requiring slightly differing methods of treatment. In making fine writing papers on the Fourdrinier machine the practice is substantially the same in every mill. The rags, which come to the mill in bales of 500 or more lbs. in weight, are first emptied into what is known as the Star duster, its shape having suggested the name. In this they are rapidly revolved until freed from dust. Then they go to the sorting-room, where white and colored, as well as different qualities, are separated, each variety being kept by itself. Around this room are tables, in the outer edge of which are securely fastened knives 18 ins. in length, resembling scythe blades, in an upright position, the edge facing the wall. The girls who do the sorting and cutting take the rags from the tables in front of them, holding an end in each hand, and quickly pull the rags across the blade of the knife, thus cutting them into smaller pieces. Buttons, or other metallic substances, are cut off and thrown away, so that the pulp may not be discolored while being bleached. After this the rags are run through a cutting machine and reduced to a nearly uniform size. From this they

pass into the screw duster, entering at one end to emerge at the opposite, where they pass into a second duster and through that to the revolving apron, which delivers them at the bleaching boilers. These are in a room below and are in a horizontal position and so constructed as to be automatically revolved. The rags are thrown into the boiler through the manhole. After the boiler is partly filled a stream of lime-water is turned on, sufficient in quantity to cover the rags, the cover to the manhole is secured, and the boiler is made to slowly revolve. The boiler is 6 ft. in diameter and 20 or more ft. in length. Steam is turned into the boiler through the hollow journals at the end and a pressure of 50 lbs. is maintained. After remaining in the boiler 12 hours, the time being determined by the color and condition of the rags, they are taken out and carried to the washer, an oval tub in which are revolving buckets covered with a wire netting. A stream of pure water is constantly running into the washer and the revolving buckets are taking out that which has been discolored. The rags, as they pass under the buckets and through the knives, are cut and torn, and as the process is continued from 6 to 8 hours they are reduced to a pulpy condition. Chloride of lime and sometimes caustic soda is mixed with the pulp to remove all colors and make it as nearly pure white as possible. When this condition is attained the pulp is precipitated through a trap in the washer to the drainer, a brick and stone chamber, with a false bottom, where it remains from 2 to 3 weeks to become firmer and harder as the water is drained from it and the process of bleaching continues. It is now known as half stock. From the drainer it is taken to the beating engine, similar in general appearance to the washer, and here the process varies according to the quality of the stock and of the paper to be made, but it is continued from 12 to 24 hours, and sometimes from 48 to 72 hours. A vegetable size and coloring matter, when required, are mixed with the pulp, which, when thoroughly incorporated, is let out of the beater into the stuff-chest, in which is an upright and continuously-revolving agitator to prevent the pulp from settling. A pump in constant operation carries the pulp from the stuff-chest to the stuff-box, where it is diluted with a constantly-flowing stream of water, and as it flows from the stuff-box into the sand-catcher, it is regulated by a hoisting-gate which determines the thickness of the sheet. In the sand-catcher the sand and what few other insoluble impurities remain are removed from the pulp, and the pulp next passes to the flow-box and thence upon the wire screen of the Fourdrinier machine, the width being regulated by endless bands of vulcanized rubber at the sides which move with the wire screen. To prevent the fiber from running in one direction and from bunching, a lateral motion is given to the wire upon which the web is forming. The roll under which the web first passes, and which is called the dandy, is made of wire, and its construction determines the character of paper that is being made, as to whether it is woven or laid. To the dandy is attached a thin engraved plate, and the impression it makes upon the paper is called the water-mark. Whenever the wires forming the dandy, or the engraved plate for the water-mark, make an impression, the sheet is thinner and the lines are easily distinguished by holding the finished paper up to the light. A powerful pump or suction-box is underneath the wire screen and exhausts the greater part of the water from the web as the latter moves. From here the web passes under the couching-roll, the purpose of which is to give the paper a soft impression, and then, being able to sustain its own weight, it runs upon an endless felt, which gives it support over the dryers. These dryers have a circumference of nearly 10 ft., are from 8 to 12 in number, and are heated by steam, the last of the series to a higher temperature than the first. After the web passes to the felt it runs between 2 rollers, known as the first press, and thence to the second press. These extract the water not removed by the suction-box. The speed of the web is from 25 to 50 ft. per minute on thick paper and from 70 to 90 on thinner qualities. After leaving the second press the felting and the web of paper pass around the drying-cylinders, and on reaching the last cylinder the felting returns, while the web pursues its way towards the cutting-knife, passing through a box of animal size to give it strength and finish, and to prevent the spreading of ink when applied to its surface. Formerly every sheet was separately dipped in the tub by hand, and this gave the name, which it still retains, of tub-sized paper. From the sizing vat the sheet passes between 2 rollers and thence to the revolving cutting-knife, where it is cut into sheets and placed in piles by a mechanical device known as the lay-boy, a circular slitting-knife having previously cut the web lengthwise into 2 parts. From the lay-boy the sheets are taken to the loft to dry (hence the name of loft-dried papers), where, in bunches of a dozen or more, they are suspended on poles, while the room is heated by steam to 100°, and remain from 36 to 48 hours. From the loft the paper is taken to the jogging-room, where girls even the sheets, which are then piled to the height of 6 ft., to remain until they are taken to the hydraulic press and subjected to great pressure. They now enter the finishing-room and are calendered or plated as required. The calender gives a higher, smooth finish, and to do this work the sheets are fed to the calenders, being carried between a series of 4 rollers of polished iron, by means of tapes, with one handling. In plating, the sheets are placed between pasteboards or plates of zinc, according to the fineness of finish required. After the boards are filled they are run through and backward between 2 metal cylinders, thus giving a soft, smooth surface to the paper, but not equal to that received in passing through the calenders. The finished sheets are next taken to sorting-tables, where each sheet is examined to determine its quality; the perfect sheets are placed in one pile, the slightly imperfect in another,

and the broken in a third, while those considerably damaged go back to be made again into pulp. Counting the sheets into quires and reams is done by hand. Formerly in finishing, most of the paper intended for printers was folded into quires, but now it is generally put up flat in bundles containing 2 reams of 480 sheets each, or in lots of 500 and 1000 sheets, the latter method being required by many printers for the convenience of counting. For newspapers printed by perfecting presses paper is put up in rolls varying from 500 to 800 lbs. each. Ruling for writing purposes and for printing is done in the mills by automatic machines.

Up to the date of the examination of the Fayum manuscripts, already mentioned, it was believed that the only size known to early paper-makers was made from glue or gelatine, and that the use of starch followed the introduction of machinery for paper-making. It is now proved beyond dispute that these manuscripts were sized with starch, either of wheat or barley, the probabilities being in favor of wheat starch.

Pure, soft water is an essential requisite for making the higher grades of writing papers. Book, news, and some cheap grades of writing papers are machine-dried—i.e., dried by passing over steam-heated cylinders and finished by running between calenders without going to the loft, but are not equal in quality to loft-dried. Paper made from poplar pulp is whiter than that made from spruce, but it lacks strength. Rye straw makes a stronger and better grade of paper than either, but until recently great difficulty was experienced in reducing the joints and the silica, a difficulty overcome by first passing the straw through an oven heated to nearly 400°. The abundance of wood and the slightly less cost of reducing it to pulp has thus far prevented the use of straw. The discovery of wood as a suitable fiber to enter into the manufacture of paper has lessened the demand for rags, and had it not been for this, with the recent increased demand the higher grades would bring fully fourfold their present market price. Wood pulp reduced by chemicals has reached such a high state of perfection that its presence in even some of the higher grades of paper can be detected only by the best experts. Poplar wood chemically treated yields only from 30–33 per cent. of its own weight, against the 65–80 per cent. yielded by clean white cotton or linen rags.

The standard sizes of writing and print papers, in inches, are as follows: Ladies' Note, 5 by 7; Commercial Note, 8 by 10; Letter, 10 by 16; Flat Cap, 14 by 17; Crown Cap, 15 by 19; Demy, 16 by 21; Folio Post, 17 by 22; Double Cap, 17 by 28; Medium, 18 by 23; Royal, 19 by 24; Super Royal, 20 by 28; Double Medium, 23 by 26; Imperial, 23 by 31; Elephant, 23 by 28; Double Royal, 24 by 38; Columbier, 23 by 34; Atlas, 26 by 33; Double Elephant, 27 by 40; Antiquarian, 31 by 53. Within recent years methods of putting up papers of 24 sheets to the quire and 20 quires to the ream have greatly changed, to conform to the requirements of customers. Formerly all papers were counted and folded into quires. Now much of that going to printers is put in flat packages, without folding, and largely in quantities of 500 sheets. Close competition and the fancies of trade have about destroyed the regard for regular sizes of both book and print papers, each customer often requiring different sizes and weights. That used in printing daily newspapers of large circulation, on the modern perfecting press, is wound in rolls, as made, of various weights—from 500 to 800 lbs. Foolscap, although still quoted by dealers, is seldom made, other sizes having taken its place.

Besides the well-known trade definitions, there are very many others, amounting, if we include paste and mill boards, to at least 12 or 15 hundred, so that even paper-manufacturers require the aid of a treatise upon the subject of the sizes, qualities, etc., and such a treatise is in common use.

Rice paper is a beautiful material imported from China, about which numberless errors have been written. It is now known to be formed of thin slices of the pith of the plant called *aralia papyrifera*. This pith can be obtained from the stems in beautiful cylinders, from 1 to 2 ins. in diameter, and several ins. in length. The Chinese workmen apply the blade of a sharp, straight knife to these cylinders of pith, and, turning them around dexterously, pare them from the circumference to the center, making a rolled layer of equal thickness throughout. This is unrolled, and weights are placed upon it until it is rendered perfectly smooth and flat. Sometimes a number are joined together to increase the size of the sheets. It will be seen that this more nearly resembles the ancient papyrus than modern paper; but it is more beautiful than the former, being a very pure pearly white, and admirably adapted to the peculiar style of painting of the Chinese.

Some useful kinds of paper are the result of manipulations subsequent to the paper-maker's work. Thus:

Lithographic Paper is prepared from good printing-paper by laying on one side of the sheets a preparation consisting of 6 parts of starch, 1 of alum, and 2 of gum-arabic dissolved in warm water and applied while hot with a proper brush. Generally a little gamboge is added, to give it a slight yellow color.

Copying Paper, for manifold writers, is made by applying a composition of lard and black-lead to one side or both of sheets of writing-paper; and, after leaving it on for a day or so, it is carefully and smoothly scraped off and wiped with a soft cloth.

Tracing Paper is good printing-paper rendered transparent by brushing it over with a mixture of Canada balsam and oil of turpentine, or nut oil and turpentine. In either case it must be carefully dried before using.

Impression Paper is used for duplicating writing. It is manufactured by mixing lamp-black and oil till it reaches the consistency of molasses. With a brush, this mixture is applied to tissue paper, which is then dried. One or both sides of the paper can be treated with the preparation. If colored impressions are desired, the lamp-black is replaced by colored chalks.

There are 2 distinct classes of colored papers. In one, the color is introduced into the pulp, and is consequently in the body of the paper; in the other, the colors are mixed with size and applied to the surface. There have been many ingenious and tasteful inventions for decorating the surface of paper, such as by giving it a marbled, and even a beautiful iridescent appearance, but they are too numerous for the limits of this article.

Paper is subject to much adulteration. China-clay and gypsum are generally used for the white sorts, and the heavy ferruginous ochres for the coarse and brown kinds.

In Great Britain Kent is celebrated for its paper-mills, and for the fine quality of its paper, and is the chief co. in this respect. Next follow Hertfordshire (where it was first commenced in England in 1490 by John Tate, of Stevenage, of whom it is said in a book printed by Caxton,

> Which late hathe in England doo make thya paper thynne,
> That now in our Englyssh thys booke is printed inne;

and the same John Tate is mentioned in Henry VII.'s household book, under dates May 25, 1498 and 1499, "for a rewarde geven at the paper-mylne," and "geven in rewarde to Tate of the mylne, 6s. 8d."), Buckinghamshire, Oxfordshire, and Lancashire.

The uses made of paper in manufactures are now almost unlimited; but in the larger part of the articles the material is not all paper, the latter forming the matrix only that binds the whole together. The manufacture of paper car-wheels has now become a large industry. In the ordinary process the straw board is cut into round disks; these are then pasted together and subjected to hydraulic pressure, afterwards dried at a high temperature and re-pressed. They are then as firm as the hardest wood, and are ready to be turned and fitted with steel tires, which are forced on under hydraulic pressure. Afterwards the hub is fitted in, and iron bands placed on both sides and held by bolts passing through the wheels. A paper wheel is practically indestructible; the tires only have to be replaced. It has also been found that axles last much longer with paper than with iron wheels. Paper has also been used for making gas-pipes; it is passed through a bath of melted asphalt, and then rolled around a core till the desired thickness is attained; and, after being pressed, makes a very strong and durable pipe. Household utensils, bottles, plates, etc., and even stoves, have been made of paper.

In 1810 the number of paper-mills in the U. S. was estimated to be 185, of which 7 were in N. H., 38 in Mass., 4 in R. I., 17 in Conn., 9 in Vt., 28 in N. Y., 60 in Pa., 4 in Del., 3 in Md., 4 in Va., 1 in S. C., 6 in Ky., and 4 in Tenn. The Fourdrinier machine was the one chiefly in use, and the bulk of the manufacture was from white rags. The mills produced at that date about 50,000 reams of newspaper annually; 70,000 reams of book paper; 111,000 reams of writing paper, and 100,000 reams of wrapping paper, together valued at about $800,000. After 20 years the business had increased so extensively that the manufacturers began to import rags in large quantities from Italy and Austria; and in 1852 the consumption of paper in the U. S. was equal to that of England and France together. By the census of 1880 there were in the U. S., exclusive of paper-hanging manufactories, 692 establishments, principally manufacturing printing, writing and wrapping paper, with a capital of $46,241,202, and producing paper annually valued at $55,109,914. In the census of 1890 the number of paper mills reported is 567, having an aggregate capital of over $82,000,000, and producing goods annually to the value of $74,309,388. Lockwood's *Directory of Paper, Stationery, and Allied Trades*, gives the number of paper and pulp mills in the United States in 1895 as 1,231, and the daily product of these mills as 20,986,180 lbs.

PAPER-BOOK, in English law, is the name given to the pleadings on both sides in an action at law, when the issue is one, not of fact, but of law.

PAPER-HANGINGS. This name is applied to the webs of paper, *papiers peints* of the French, usually decorated, with which interior walls are often covered. Previous to the invention of the paper-machine, sheets of paper of the size called *elephant*, 22 by 32 inches, were pasted together, to make 12-yard lengths, before the pattern was imprinted; but this is now rendered unnecessary by the facility of making webs of any length. Upon the paper it is usual first to spread a ground-color, with proper brushes, taking care to produce a perfectly smooth surface. The colors employed are opaque, and are mixed with size, and sometimes also with starch, and most of the ordinary pigments are used. In the early stages of the art, it was usual to have the patterns stenciled (see STENCILING) on the ground-color. The stenciling plates were usually pieces of pasteboard, one being required for every differently colored portion of the pattern. Afterwards, wooden blocks were adopted, similar to those used in calico-printing, made of pear or poplar wood, generally the width of the paper, forming, indeed, huge woodcuts, on which the pattern is in high relief. As many blocks are required as there are colors in the pattern, each bearing only so much of the pattern as is represented by the color to which it is assigned. Of course, the whole beauty of the work depends upon the nice adjustment of one portion of the pattern to another; and this is determined by guide-pins in the blocks, which are so managed as not to disfigure the surface with their

points. The pattern-block, being coated with its particular color from the color-tub is laid on the paper, which is stretched out for the purpose on a table, and a lever is brought to bear upon it with sufficient pressure to make the whole of the block bear equally upon the paper. When one block has been printed the whole length of the paper by a succession of impressions, the piece is taken to the drying-room, and dried, previous to receiving the next color; and it often happens that the same operations have to be repeated a dozen different times before the pattern is completed. This process is now being rapidly superseded by the cylinder printing-machines, which are of the same kind as are used in printing textile fabrics. In these machines, the pattern is engraved on a series of copper cylinders, and each part or color has a separate cylinder, and an arrangement for keeping it constantly supplied with color when working. The cylinders are so arranged as, by the sum of their revolutions, to make the pattern complete; so that as the web of paper passes the first, it receives the color for one portion of the pattern, and reaches the second in exact time to have the next color applied in the right places. In this way the entire piece only occupies a few seconds in receiving the complete decoration.

The polished or glazed papers have the ground prepared with gypsum or plaster of Paris, and the surface dusted with finely-powdered steatite, or French chalk. When perfectly dry, this is rubbed hard with a burnishing-brush, until the whole is evenly polished. This is generally done before the pattern is printed, but in some cases pattern and ground are both polished. In making the *flock-papers*, the printing is done in the same way as in the block-printing, only, instead of colored material, a composition called *encaustic* is printed on. It consists of linseed-oil, boiled with litharge, and ground up with white lead; sufficient litharge is used to make it dry quickly, as it is very adhesive. The flock is prepared from the shearings of woolen cloths from the cloth-mills, by washing and dyeing the shearings to the various colors, then stove-drying and grinding them in a peculiar mill, which, in their brittle state, after leaving the stove, breaks them short. After this they are sifted, to obtain various degrees of fineness. By nice management, the prepared flock is so sprinkled over the whole of the printed surface as to coat the encaustic, and adhere evenly and firmly to it. The same adhesive material is used for printing in gold and other metals. The pattern being printed with the encaustic, gold or other metallic leaf is applied, and when it is properly fixed, the loose metal is brushed away with a hare's foot or other soft brush. Some of the finest French papers have much of the pattern actually painted in by hand, a process which, of course, renders them very costly.

Paper hangings appear to have been used by the Chinese at an early period, but were not introduced into Europe, to any extent, before the 18th c. Hangings of canvas, painted to imitate tapestry, were extensively used during the 15th and 16th centuries. The well-known "Triumph of Julius Cæsar," by Mantegna, now at Hampton Court, England, is simply a consecutive set of such hangings. During the 16th and 17th centuries a thriving business was done in Italy and Spain (particularly at Cordova) in the manufacture of hangings of leather variously stamped and embossed, and from these countries the art was carried into France and England.

Paper hangings, as the term is used in the U. S., comprise 4 distinct classes of goods: wall-papers, with borders; dados and hall fresco papers; ceiling papers, with or without borders, and window curtains. The value of the goods manufactured in this country rose from $2,148,800 in 1860, to about $12,000,000 in 1885, although the number of establishments was about the same—26. The manufacture increased rapidly after 1870, chiefly on account of the introduction of machine printing, and the stimulus given to original designing by the exhibit of foreign wall-papers at the Centennial exposition; and at present the paper hangings produced here rival, in quality and tastefulness, the best foreign goods. The centres of the industry are the cities of New York and Brooklyn; but the materials used, chiefly old newspaper stock, come from paper-mills in Massachusetts, Connecticut, and New York state, outside of the cities mentioned.

PAPER MULBERRY. See MULBERRY.

PAPER NAUTILUS. See ARGONAUT.

PAPER WEDDING. See WEDDING ANNIVERSARIES.

PAPHLAGO'NIA, anciently a province of Asia Minor, extending along the southern shores of the Black sea, from the Halys on the e., to the Parthenius on the w. (which separates it from Bithynia), an island on the s. to Galatia. Its limits, however, were somewhat different at different times. The Paphlagonian mountains were covered with forests, and the inhabitants were famous as hunters. Crœsus made Paphlagonia a part of the kingdom of Lydia, and Cyrus united it to Persia; it subsequently became part of the empire of Alexander the Great, and afterwards of the kingdom of Pontus, was included in the Roman province of Galatia, and in the 4th c. of the Christian era was made a separate province by Constantine. Its capital was Sinope. The Paphlagonians are supposed to have been of Syrian, or at least of Semitic origin, like the Cappadocians.

PA'PHOS, anciently the name of two cities in the isle of Cyprus. The older city, sometimes called *Palaipaphos* (now *Kuklos* or *Konuklia*), was situated in the western part of the island, about 1¼ m. from the coast. It was probably founded by the Phenicians, and was famous, even before Homer's time, for a temple of Venus, who was said to have

here risen from the sea close by, whence her epithet *Aphrodite*, "foam-sprung," and who was designated the Paphian goddess. This was her chief residence, and hither crowds of pilgrims used to come in ancient times. The other Paphos, called *Neopaphos* (now *Baffa*), was on the sea-coast, about 7 or 8 m. n.w. of the older city, and was the place in which the apostle Paul proclaimed the gospel before the proconsul Sergius.

PAPIAS, bishop of Hierapolis in Phyrgia, was a Christian writer, who flourished in the 2d century. According to Irenæus, he was a disciple of the apostle John; but Eusebius, who quotes (*Historia Ecclesiastica*, chap. 39) the words of Irenæus, immediately subjoins a passage from Papias himself, in which the latter distinctly states that he did not receive his doctrines from any of the apostles, but from the "living voice" of such followers of theirs as "are still surviving." He was, however, an "associate" of Polycarp, a bishop in the same province of proconsular Asia; and as the latter was a disciple of the apostle John, it is probable that Irenæus—a somewhat hasty writer—inferred that his companion must have been the same. The *Paschal or Alexandrian Chronicle* states that he suffered martyrdom at Pergamus, 163 A.D. Eusebius describes Papias as "well skilled in all manner of learning, and well acquainted with the Scriptures;" but a little further on he speaks of him as a man "of limited understanding" *smikròs ôn tòn noûn*), and a very credulous chronicler of "unwritten tradition," who had collected "certain strange parables of our Lord and of his doctrine, and some other matters *rather too fabulous.*" The work in which these were contained was entitled *Logiôn Kuriakôn, Exegêseôs Biblia E'*. (Five books of commentaries on the sayings of our Lord). It is now lost, but certain fragments of it have been preserved by Irenæus, Eusebius, Maximus Confessor, and other writers. These fragments are extremely interesting, because of the light which they throw on the origin of the New Testament Scriptures, and their importance may be estimated from the fact, that they contain the earliest information which we possess on the subject. It is Papias who is our authority for the statement, that the evangelist Matthew drew up a collection of our Lord's sayings and doings (*ta logia*) in the Hebrew (probably Syro-Chaldaic or Aramaic) dialect, and that every one translated it as he was able. There can be no doubt that this is a perplexing statement, suggesting as it does the delicate question: "If Papias is correct, who wrote our present Matthew, which is in Greek, and not in Hebrew?" (For a consideration of this point, see MATTHEW.) Papias also tells us, either on the authority of John the presbyter, or more probably on that of one of his followers, that the evangelist Mark was the interpreter (Hermeneutes) of Peter, and wrote "whatsoever he [Peter] recorded with great accuracy." But the passage is far from implying that Mark was a mere amanuensis of Peter, as some have asserted, but only, as Valesius has shown, that Mark listened attentively to Peter's preaching, culled from it such things as most strictly concerned Christ, and so drew up his gospel. Papias, it remains to be said, was an extreme millenarian. See MILLENNIUM.

PAPIER-MACHÉ (Fr. mashed or pulped paper). This manufacture has certainly been in use for more than a century in Europe; but it is not improbable that it was first suggested by some of the beautiful productions of Sinde and other parts of India, where it is employed in making boxes, trays, etc., as well as in China and Japan. Its first application, as far as we know, was to the manufacture of snuff-boxes by a German named Martin, in 1740, who learned it of a Frenchman named Lefevre; but the French say that he learned the art in England. Properly speaking, paper-maché is paper-pulp molded into shape, and it has been used, not only to make small articles, such as boxes, trays, etc., but in the interior decoration of houses for cornices, ceilings, etc. The ceilings in Chesterfield house, and some other fine Elizabethan structures, are made of this material, which at one time, owing to a combination of the stucco-workers to raise the price of their labor, took the place almost entirely of stucco in house ornamentation. At present a combination of both stucco and paper is similarly employed under the name of *Carton-pierre*. From the extension of the applications of papier-maché to the manufacture of a number of light and useful articles, modifications have taken place in its composition, and it is now of three kinds—1st, the true kind, made of paper-pulp; 2d, sheets of paper pasted together after the manner of pasteboard, but submitted to far greater pressure; and 3d, sheets of thick millboard cast from the pulp are also heavily pressed. The term papier-maché is in trade held to apply rather to the articles made of the pulp than to the pulp itself; and a vast manufacture has sprung up during the present century, particularly in Birmingham, in which a great variety of articles of use and ornament are made of this material. They are coated with successive layers of asphalt varnish, which is acted upon by heat in ovens until its volatile parts are dissipated, and it becomes hard, and capable of receiving a high polish. Mother-of-pearl is much used in their decoration, for which purpose, when several layers of the varnish still remain to be applied, thin flakes of the shell of the form of the pattern are placed on the varnish, and are covered by the succeeding layers, giving rise to elevations where they are hidden by the coats of varnish. The surface is then ground down smooth and polished, and the grinding down brings to light the pieces of mother-of-pearl shell, which thus present the appearance of inlaid patterns. The fine surface which can be given to the asphalt varnish also permits of burnished gilding and other decorative applications with excellent effect.

PAPILIO. See BUTTERFLY.

PAPILIONA'CEÆ, a suborder of the natural order of plants generally called *leguminosæ* (q.v.).—The plants of this suborder are the only plants known which have flowers of the peculiar structure called *papilionaceous*, and of which the pea and bean afford familiar examples. The name is derived from Lat. *papilio*, a butterfly. Papilionaceous flowers have five petals, imbricated in estivation (bud), one of which, called the *vexillum*, or *standard*, is superior, turned next to the axis, and in estivation folded over the rest; two, called the *alæ*, or *wings*, are lateral; and two are inferior, which are often united by their lower margins, forming the *carina*, or *keel*. The number of the papilionaceæ is very great, about 4,800 species being known. They are found in all parts of the world, abounding in the tropics. Many have superb and beautiful flowers; many are plants of beautiful form and foliage, trees, shrubs, or herbaceous plants; many possess valuable medicinal properties; and many are of great importance as furnishing food for man and for domestic animals, others as furnishing dyes, fiber, timber, etc. See Broom, Laburnum, Clover, Bean, Pea, Lucerne, Licorice, Indigo, Sandal-wood, etc.

PAPILLÆ. This term is applied by anatomists to minute, elongated, conical processes, projecting from the surface of the true skin into the epidermis, highly vascular and nervous in their character, and taking an active part in the sense of touch. Their form and structure are described in the article Skin. The mucous membrane of the tongue also contains three varieties of papillæ, which are described in the article Taste, Organ, and Sense of.

PAPIN, Denis, a celebrated French physicist, was b. at Blois, Aug. 22, 1647, and studied medicine, where, after receiving his degree, he practiced for some time as a physician. He now became acquainted with Huygens, an incident which strengthened in him an original predilection for physical science; and from this time he devoted himself almost exclusively to his favorite study. Before Papin's time, the intense force which can be generated in water, air, etc., under the action of heat, was well known, but he was one of the first to indicate the principal features of a machine by which this property could be made of practical utility. He soon acquired a wide reputation, and on visiting England was received with open arms by the philosophers of that country, and became a member of the Royal Society in 1681. While in England, Papin and Robert Boyle (q.v.) together repeated their experiments on the properties of air, etc.; but in 1687 Papin was called to the chair of mathematics in the university of Marburg in Hesse-Cassel, the duties of which office he discharged with zeal and success for many years. He died in poverty at Marburg, 1712. The French academy of sciences, withholding from Papin the honor of "associate," enrolled him among its "correspondents"—a proceeding on the part of the academy which has, with reason, excited the astonishment of F. Arago. To Papin undoubtedly belongs the high honor of having first applied steam to produce motion by raising a piston; he combined with this the simplest means of producing a vacuum beneath the raised piston, viz., by condensation of aqueous vapor; he is also the inventor of the "safety-valve," an essential part of his "digester" (q.v.). By this latter machine Papin showed that liquids in a vacuum can be put in a state of ebullition at a much lower temperature than when freely exposed to the air. Papin's sagacity led him to many other discoveries; he discovered the principle of action of the siphon, improved the pneumatic machine of Otto Von Guericke (q.v.), and took part against Leibnitz in the discussion containing "living" and "dead" forces. Unfortunately for science, Papin's numerous writings have not yet been collected, but many of them will be found in the *Philosophical Transactions*, *Acta Eruditorum*, and the *Recueil de Diverses Pièces*. He published two works, one being an explanation of the construction and uses of his "digester" (Lond. 1681), afterwards (1682) translated into French, and his experiments entitled *Nouvelles Expériences du Vide* (Paris, 1674). It was not till nearly a century after that the great value of Papin's work was perceived. See his *Life*, by Gerland.

PAPINEAU, Louis Joseph, 1789–1871; b. Montreal, educated at the seminary of Quebec, studied law, was repeatedly elected member of the Canadian parliament, was speaker of the lower house and leader of the radical party, and appointed by lord Dalhousie one of the executive council. In 1827, when he was again member of parliament, he was elected speaker, but lord Dalhousie adjourned parliament to prevent his taking his seat until the following year. He prepared the list of demands and grievances known as the 92 resolutions. He did not countenance the rebellion of 1837, advocating peaceful resistance, and refused to join in any attempts at redress by force of arms. He was nevertheless suspected of complicity and accused of high treason, but escaped to the United States, and went to France in 1839, living in Paris 8 years. He returned in 1847, under the general amnesty of 1840, and was once more elected to parliament. In 1854 he retired to private life.

PAPINIA'NUS, Æmilius Paullus, the most celebrated of Roman jurists, was b. towards the middle of the 2d c.; and during the reign of the emperor Severus (q.v.), whom he succeeded as *advocatus fisci*, and whose second wife is said to have been Papinianus's relative, he held the office of *libellorum magister*, and afterwards that of *præfectus prætorio*. After the death of Severus, his son and successor, Caracalla, dismissed Papinianus from his office, and soon afterwards caused him to be put to death on various pretexts, the real reason, however, appearing to be that the emperor was afraid the influence of a man so able and upright would be dangerous to his power. Papinianus's works consist

chiefly of 37 books of *Quæstiones*, 19 of *Responsa*, 2 of *Definitiones*, two works, *De Adulteriis*, and a Greek fragment; and from these works there are in all 595 excerpts in the digest (q.v.). The pupils of Papinianus include the most famous names in Roman jurisprudence, such as Ulpian, Paullus, Pomponius, Africanus, Florentinus, and Modestinus, but the master stands superior to them all. The high reputation he enjoyed among his contemporaries and successors may be gathered from the epithets *prudentissimus, consultissimus, disertissimus*, bestowed upon him by various emperors, and from the first book of the Codex Theodosii, *De Responsis Prudentum*, in which, after declaring the works of Papinianus, Paullus, Caius, Ulpian, Modestinus, and four others, to be authority for a judge's decision, it is declared that should these jurists be equally divided in opinion, that opinion which was maintained by Papinianus was to be considered right; while his commentator, the celebrated Cujacius (q.v.), goes so far as to declare "that Papinianus was the first of all lawyers who have been, or are to be," and that "no one ever will equal him." His high reputation as a jurist was much enhanced by the strong moral feeling and stern unbending honesty which were equally characteristic of him, and which have stamped his works with an ineffaceable impress. Papinianus's works were studied both before and after Justinian's time by Roman legal students of the third year, who were for this reason denominated Papinianistæ. The fragments of Papinianus's works which now remain are somewhat obscure, and the excerpts from them in the digest are in general so brief that the aid of a commentator is required.

PAPIST (Lat. *papista*, an adherent of the pope) is a name applied, generally with some admixture of contempt, to members of the Roman church. Of itself, it implies nothing more than that they are adherents of the pope; but in its popular use it includes all the distinctive doctrines of Roman Catholics, and especially those which are supposed to be peculiarly cherished by the supporters of the papal authority. It is therefore in many cases held to be synonymous with the profession of the extremest opinions permitted in the church of Rome, and even those which are popularly regarded as superstitious. Understood literally, no consistent Roman Catholic would disclaim it; but in the imputed signification explained above, it is held to be offensive.

PAPPENHEIM, Gottfried Heinrich, Count von, an imperial gen. of great note in the thirty years' war, was b. at Pappenheim, in middle Franconia, Bavaria, May 29, 1594, of a very ancient Swabian family, in which the dignity of marshal of the empire became hereditary about the 13th or 14th c., and many of whose members had greatly distinguished themselves in the wars of the middle ages. When about 20 years of age, Pappenheim went over to the Roman Catholic church, and thenceforth signalized himself by his fiery zeal in its cause. After serving under the king of Poland in his wars with the Russians and Turks, Pappenheim joined the army of the Catholic league, and in the battle of Prague (1620) stayed the flight of the Austrian cavalry, and by a well-timed and furious charge turned the tide of battle against the Bohemians. In 1623 he received from the emperor the command of a cavalry regiment of the famous "Pappenheimer dragoons;" and in 1625 became gen. of the Spanish horse in Lombardy; but in 1626 re-entered the Austrian service, and after suppressing a dangerous revolt of the peasants of Upper Austria, in which 40,000 of the peasants perished, he joined the army which was opposed to the Protestant league, and, in association with Tilly, carried on many campaigns against the Danes, Swedes, and Saxons. It was Pappenheim who urged and induced Tilly to take Magdeburg by assault, and himself led and directed the attack. Moreover, it is he, rather than Tilly, who was to blame for the ferocious massacres which followed. His reckless bravery involved Tilly, against his will, in the disastrous battle of Breitenfeld; but to some extent he retrieved his character by his strenuous efforts to remedy the loss, and protect the retreat of the army. After Tilly's death, he was associated with Wallenstein, who detached him with eight regiments to protect Cologne, but on hearing of the advance of Gustavus, sent an urgent order for his return. Pappenheim arrived at Lützen at the moment when Wallenstein's army was on the point of being completely routed, and at the head of his cuirassiers, charged the left wing of the Swedes, throwing it into confusion, and almost changing the fortune of the battle by his extraordinary bravery. He was mortally wounded in the last charge, and died a few hours afterwards at Leipsic, Nov. 7, 1632, with a smile on his countenance, after learning that Gustavus Adolphus had died before him. "God be praised!" he said; "I can go in peace, now that that mortal enemy of the Catholic faith has had to die before me."

PAP'PUS, in botany, an appendage of the fruit of plants belonging to certain natural orders, of which the great natural order *compositæ* is the chief. It consists either of simple or feathery hairs, sessile or stalked, arising from the summit of the fruit, and is produced by a development of the tube and limb of the persistent calyx. Its object appears to be to waft the ripened seed to the new situation in which it is to grow. *Thistle-down* is the pappus of the thistle.—The pappus is sometimes represented by mere teeth or scales.

PAPPUS of Alexandria, one of the later Greek geometers, of whose history nothing is known; he is said by Suidas to have lived during the reign of Theodosius the great, emperor of the east (379–395). Some writers are of opinion that he lived two centuries

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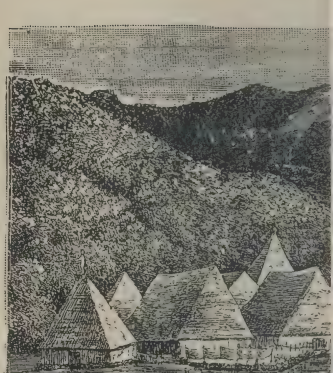

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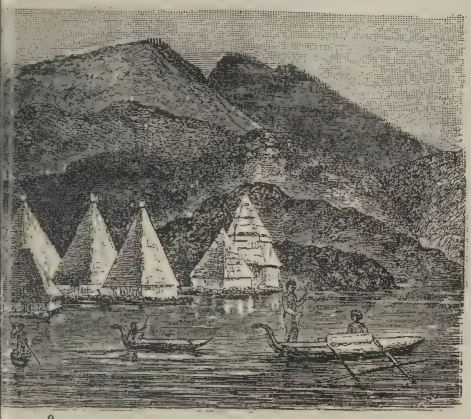
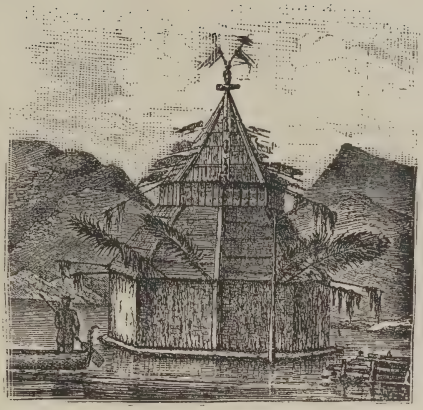
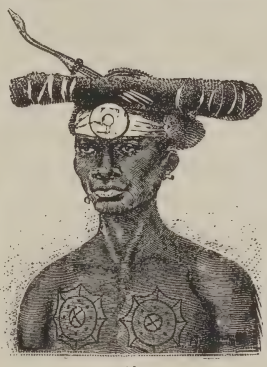
Papua and Caroline Islands.—1. Village on south-west coast of New Guinea. 2. Vill
5. Dorei idol. 6, 13. Dorei shields. 7. Dorei bow. 8. South-west coast bow. 9
14. Head-rest, Humboldt Bay. 15. Dorei drum (Tifa). 16. Dirk made of human
20. Vessel at Lugunor. 21. Ruins at Tinian and Rota (Marianne Isles). 22. Hous







at Humboldt Bay, New Guinea. 3. Village temple. 4. Native of Dorei in festival dress. Dorei comb. 10. Arrow-head. 11. Calabash. 12. Carved boat ornament, Humboldt Bay. e. 17. Dorei ear-ring. 18. Arfaki. 19. Natives of Humboldt Bay. *Caroline Islands:* Lugunor. 23. House at Ualan.

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earlier, but the former is much the more probable opinion. The chief work of Pappus is his *Mathematical Collections*, of which the last six, out of eight books, are extant. The *Collections*, as their name implies, are an assemblage into one book of scattered problems and theorems, the work of Apollonius, Archimedes, Euclid, Theodosius, etc., to which he has joined his own discoveries. The first two books are supposed (on insufficient grounds) to have treated of arithmetic and arithmetical problems, but only a small fragment of the second book is extant: the third book is a collection of problems, mostly of solid geometry: the fourth treats of curves other than the circle, according to the method of pure geometry; the fifth contains problems of maxima and minima: the sixth treats of the geometry of the sphere: the seventh, which is by far the most important to modern geometers, as it is almost the sole authority we possess on the subject of the history and methods of the Greek geometrical analysis, treats principally of analysis; it also contains the proposition now known as "Guldinus's theorem," which was plagiarized from Pappus by Father Guldin; the eighth and last book treats of machines. Pappus was the author of several other works which are lost, excepting only a fragment of his *Commentary on Four Books of Ptolemy's Syntaxis*. Pappus, as an independent investigator, enjoys a high reputation, and is considered by Descartes as one of the most excellent geometers of antiquity. Some of his problems have been looked upon with high interest by all succeeding geometers. The *Mathematical Collections* have been published in whole or part, at various periods, but the only complete editions are the two Latin versions, the first by Commandine (Pisa, 1588), and the second by Manolessius (Bologna, 1660), and the Greek edition of H. J. Eisenmann (Paris, 1824). The portion of the Greek text of the second book, which was wanting in Commandine's MS., was published (1688) in London by Dr. Wallis.

PAPUA, or NEW GUINEA, is, with the exception of Australia, the largest island on the globe. It lies in lat. 0° 30′ to 12° s., and long. 130° 50′ to 154° 30′ e., and is about 1500 m. in length. In outline the island is very irregular, the western part being nearly insulated by Geelvink bay, on the n., and M'Clure's inlet from the west. The head of Geelvink bay is separated from the s. coast by an isthmus only 35 m. in breadth. Eastward from this, the island increases in breadth from 200 to 360 m., and terminates in the s.e. in a long and narrow peninsula of lofty mountains. Estimated area, 313,000 sq. m.

There is probably no region of the globe so little known as Papua; the coast has not even been visited in some parts, and the maps published to this day show unsurveyed portions. It is not known with certainty who discovered Papua. It is attributed to a Spaniard, Alvaro de Saavadra. To him the first detailed notice of the island is due, and it was he who first noticed the resemblance of the inhabitants to African negroes, and for that reason gave the country the name of New Guinea. In 1606 the Spanish frigate *La Almiranta*, capt. Luiz Vaes de Torres, made the island, and sailed along the southern shore to the strait that bears his name. In 1676 the Dutch captains, Schouten and Le Maire, landed on the island to obtain fresh water. They were unexpectedly attacked by the natives, who killed 18 of their men. M. De Bougainville, in 1768, also made the south coast of the island, and worked to windward along it. The English navigators, Cook in 1770, and Forrest in 1774, Edwards in 1791, and the following year Capt. Bligh, of *Bounty* notoriety, saw portions of the south coast. Flinders, in 1799, visited the island, and added a few facts to our scanty information. In the course of the voyage of the French ship *Astrolabe*, under the command of J. Dumont d'Urville, the distinguished naturalists, Quoi and Gaymard, studied the natural history of the island, and more especially its zoology. A Dutch expedition in 1828 added to the information of the western coast. In 1845 Capts. Blackwood and Owen Stanley, of her majesty's ships *Fly* and *Bramble*, surveyed part of the southern coast; and, between 1846 and 1850, the last-named officer surveyed the southern shores of the eastern peninsula. In 1858 the Dutch government sent a surveying expedition in the steamer *Etna* to the north and n.w. coasts. In 1869 attention was called to our lack of information on Papua, and to the fact that so little had been done to explore this great and fertile island, which lay almost within sight of Australia, and might be looked on as belonging to that continent. Sir Charles Nicholson especially directed the attention of our Australian colonists to the importance of their becoming acquainted with the island, lying as it does, on the highway to India and China, and believed to be rich in minerals and commercial products. The importance of exploring the island was generally admitted. In 1871 the Russian steam corvette, the *Vitiaz*, left on the n.e. shores the naturalist, Mikklouka Maclay, who undertook to penetrate westward into the Dutch territory. The Italian travelers, Messrs. Beccari and D'Albertis, and the Italian corvette *Vittor Pisani*, also visited the island. Early in 1873 H.M.S. *Basilisk*, Capt. Moresby, was sent to suppress the system of kidnapping natives in the neighborhood of Torres strait; and this being accomplished, Capt. Moresby employed his time in continuing the survey of the eastern coasts commenced by Capt. Owen Stanley. He found the eastern part of the island different in form from the representations as given on our maps, inasmuch as a considerable portion of the eastern promontory consisted of islands with deep channels between, instead of being a continuous line of coast. But little is known of the geography of the island beyond the coast. The northern side is hilly and densely covered with wood, while such portions of the southern coasts as have been visited are low, and

apparently swampy, but still densely wooded. A range of mountains, the Charles Louis mountains, commences on the south coast near Geelvink bay, and extends due east, rising gradually to a height of 16,730 ft., where it is lost sight of at a distance of 100 m. from the coast; but it is not improbable that this range continues through, and subdivides the island until it joins the high land of the eastern peninsula, where a succession of mountains, from 14,000 to 5,000 ft. high, continue to the eastern extreme. A large island, Frederick Henry island, 100 m. long by about 50 broad, on the s.w. coast, was supposed to be part of the mainland until lieut. Kool, of the Dutch navy, passed through the strait that separated it. The London missionary society's agents, in their steamer the *Ellangowan*, have also lately found that what was considered the south cape of Papua is detached from the mainland, and have called it Stacey island. The Fly river has been ascended 160 miles by the same parties. The whole of the south-eastern coast to the eastern extreme of the island, and continuing to the Louisiade archipelago beyond, is fringed with dangerous coral reefs, and, as during the monsoons the currents acquire great velocity, the danger of navigating is considerable. Capt. Moresby has discovered a new passage at the s.e. point of the main island, China strait, which is navigable for large ships, and apparently free from dangers; it is considered that this discovery will lead to more rapid communication between China and Australia. The tides, however, at springs, run at the rate of 5 or 6 knots, but more careful and elaborate surveys will doubtless render navigation more safe and expeditious in these waters.

There cannot be a doubt that in an island of such vast extent as Papua, not only does the character of the human family greatly diverge, but there may possibly exist several distinct races. With our little knowledge, two distinct races are admitted, viz., the Papuans, so called from the Malayan "frizzled hair," and the Haraforas. The Papuans are said to resemble the Australian aborigines, but, as a rule, are stouter. The Haraforas are distinguishable from the Papuans by lighter color and straighter hair; they also exhibit greater activity of body.

Except in the swampy districts, the climate is not unhealthy, though the temperature varies greatly, the thermometer sometimes indicating 95° Fahr. by day, and falling to 75° by night. On the s.w. coast, the east monsoon or rainy season begins about the middle of April, and ends in September; the dry season is from September to April, and on the n. coast they are just reversed.

The island is everywhere clothed with the most luxuriant vegetation, cocoa-nut, betel, sago, banana, bread-fruit, orange, lemon, and other fruit-trees lining the shores; while in the interior are abundance of fine timber trees, as the iron-wood, ebony, canary-wood, the wild nutmeg, and the massooi, the fragrant bark of which is a leading article of export from the s.w. coast. In the districts of the Arfak and Amberbakin mountains the sugar-cane, tobacco, and rice are cultivated.

The natural history of the western part of Papua has been recently examined by Mr. Wallace. This naturalist established the fact that a deep channel in the bed of the ocean, running w. of Celebes, and e. of the great islands of Java and Borneo, now known as Wallace's line, separates two regions, in which the islands rise from shallow waters, and which are totally unlike each other in their botany and zoology. The islands on either side of this line he supposes to be the relics of submerged continents. Those on the west, or the Great Malay islands, belong to the continent of Asia, and have its plants and animals. Those to the east of the line, on the other hand, including Papua, have a flora and fauna resembling those of Australia. The latter island has a dry climate and stunted vegetation. Papua, on the contrary, has a warm and moist climate, pre-eminently fitted to produce a varied, luxuriant vegetation; and it is clothed from end to end with magnificent forests. Insect life is, as might be expected, abundant and varied; the Papuan species being remarkable for fine forms and beautiful colors. Still more interesting to the naturalist is the variety of birds, of which 120 species are singers, 30 parrots, and 28 pigeons. Those of land species which have been examined belong to 108 genera, 29 of which are found exclusively in Papua. The beautiful birds of paradise are peculiar to the island, and distinguish it from all other regions. In contrast to this variety of birds is the small number of mammals. The great pachyderms and quadrumana of the Malay islands are wanting, and the mammals are 2 bats, 1 pig, 10 marsupials, 1 cetacea, and 1 carnivora. There is one true kangaroo similar to those of Australia. The climbing kangaroos take the place of the monkeys of the Asiatic area. It is believed that Wallace's line, or one nearly coincident with it, separates two varieties of the human race, the Malays and the Papuans, or rather areas in which one of these races predominates.

Mr. Alfred Wallace, in his *Malay Archipelago*, says of the Papuans: "There has been much difference of opinion about the races of the Oceanic region, but it is generally admitted that they belong to four different types—those of (1) the Malays; (2) the Negritos or Papuans; (3) the Polynesians; (4) the Australians. The most distinguished of recent ethnologists class the Malays with the Mongols; the Negritos or Papuans, and the Polynesians, with the negroes of Africa; and distinguish widely the Australians from both. They do not recognize any fundamental distinction between the dark Papuans and the light-complexioned Polynesians. The western parts of the island are inhabited by the former, the eastern parts by the latter. "The Papuans are well made, have regular features, intelligent black eyes, small white teeth, curly hair, thick lips,

and large mouth; the nose is sharp, but flat beneath, the nostrils large, and the skin dark brown. They are," Mr. Wallace says, "superior in stature to average Europeans, but have long and thin legs, and the splay foot of the negro." He thinks the Papuans superior to the Malays in intelligence. In the western parts, they are divided into small distinct tribes, frequently at war with each other. The men build the houses, hollow the trunks of trees into canoes, hunt and fish; while the women do all the heaviest work, cultivating the fields, making mats, pots, and cutting wood. Their food consists of maize, sago, rice, fish, birds, the flesh of wild pigs, and fruits, etc. "They are copper colored, of a light active build, often with very good features, which they paint; but the men's teeth and mouths are much disfigured by constant use of betel-nut. The hair is usually worn frizzled out into a huge mop. The women's hair is always cut short. Their weapons appear to be spears, swords, clubs, and stone hatchets, but no bows and arrows were seen amongst them. Occasionally human jaw and spinal bones are worn as bracelets and ornaments. They appeared to take pleasure in making us understand that they had eaten the original owners of the bones; but these bones, as well as the few skulls exhibited in their villages, appeared to be of an ancient date. The houses are built after the Malay fashion, on poles raised 5 or 6 ft. above the ground, and consist of one large apartment." The natives of Humboldt's bay have a temple in every village, though nothing is known of their religion.

In the eastern part of the island, the negro type of the inhabitants passes into that of the Polynesians. Captain Moresby says of them, that they have the light complexion and in all respects the appearance of the Polynesians, typically represented by the New Zealanders, that they are a friendly and intelligent people, and gladly received the English seamen at their villages, where they mixed freely with them. They practice several useful arts, such as pottery, and possess extensive, well-fenced plantations. In the north-eastern part of the island, their villages are terraced and cultivated to a great height, in a manner which a Chinaman might envy. Captain Moresby believes them to be a fine, promising race, and thinks that a prosperous future is in store for them. In addition to foregoing illus., for type of people, see illus., ETHNOLOGY, vol. V.

The Dutch scientific expedition of 1858 appended to their report a vocabulary of the Myfore language, of about 1,200 words, collected by Ottow and Geisler, missionaries at Doreh, on the w. of Geelvink bay. It is, however, known to differ greatly from languages spoken in other parts; and natives of the South Sea islands have a facility in communicating with the Papuans on the Torres Strait. The London missionary society has therefore begun to Christianize them through Samoan teachers directed by British missionaries. The first chapel, on Murray Island, was opened in 1875.

The population of Papua and the immediately adjacent islands has been estimated at 800,000, but no correct estimate of the numbers can be formed. The exports are masooi bark, trepang or bêche-de-mer, tortoise-shell, pearls, nutmegs, birds of paradise, crown-pigeons, ebony, resin, slaves, etc.

The inhabitants seem to be divided into a great number of petty tribes, quite independent of each other. No native government is known to extend over a great part of the island. The Dutch acquired the rights of their tributary, the sultan of Tidore, and it was partly to assert them that an expedition was undertaken in 1828. At this time, the Dutch built a fort called Du Bus, in Triton bay, 3° 46′ s. lat., and 134° e. long., and declared the whole island w. of a line running from cape Bonpland in the n., along 141° e. long., to Torres Strait, to belong to the Netherlands, but the settlement was abandoned. In 1858 the Dutch made another attempt to establish a colony.

In 1883, Apr., the ministry of Queensland proclaimed the annexation to that colony of the e. half of New Guinea: Lord Derby, on behalf of the home government, promptly disavowed the act; but in 1884, May, the British government determined to establish a protectorate over the s. coast, and instructions were issued to Admiral Erskine, at the Australian station. Accordingly, he sailed in the *Nelson*, and from Port Moresby, Nov. 6, proclaimed the protectorate, and appointed the principal chief as the queen's deputy lieut. The protectorate extends from the 141st meridian eastward, as far as East Cape, and includes the adjacent islands. A short time after the British occupation of the s. coast the German government took possession of the n., together with the islands of New Britain, New Ireland, and several others. The Australians were so indignant that the home government should allow the Germans to annex territory deemed essential to their own prosperity, that the question of their separation from Great Britain was agitated. In 1893 the English and Dutch made an agreement as to a new and more natural frontier.

See *The Western Pacific*, by W. Coote (1883); the *Malay Archipelago*, by A. R. Wallace; *Neu Guinea und seine Bewohner*, by Otto Finsch (Bremen, 1865); *Dall' Italia alla Nuova Guinea—Viaggio della Corvetta "Vittor Pisani"* (Florence, 1873); *New Guinea*, by L. M. d'Albertis (1880); paper by Giglioli, in *Ocean Highways* for December, 1873; *Discoveries and Surveys in New Guinea and the D'Entrecasteaux Islands*, by Captain Moresby (1876); *Chronicle of London Missionary Society* for 1876; *Proceedings of the Geographical Society* (1879); Zöller, *Deutsch Neuguinea* (1891).

PAP'ULÆ AND **PAPULAR DISEASES.** Papulæ, or pimples, constitute one of the eight orders of Bateman and Willan's classification of cutaneous diseases. They occur as little elevations of the cuticle, of a red color, containing neither pus nor any other fluid, and ending usually in a scurf. They are generally supposed to denote inflammation of the papillæ of the skin; but Erasmus Wilson believes that they represent an

inflammatory condition of the secretory orifices, whether sudoriferous or sebaceous. The diseases regarded as papular are strophulus, lichen, and prurigo; but there are other diseases in which the first external symptom is a papular eruption, as, for example, small-pox, in which the papula speedily develops itself into a pustule.

PAPY'RI. Rolls made of the paper of the papyrus plant are commonly known as *papyri*, corresponding to the Greek *biblia*. These rolls are of a very remote antiquity, some of the still remaining Egyptian papyri being certainly as old as the sixth dynasty, and others as old as the twelfth, or from about 2,000 B.C. This is owing to their mode of preservation, and to the peculiarly dry character of Egypt. These rolls have been found deposited in different ways, those of a religious nature being placed upon the bodies of mummies, at the feet, arms, or even in the hands, sometimes, indeed, packed or laid between the bandages, or even spread over the whole bandages, like a shroud. At the time of the nineteenth and twentieth dynasties (1320–1200 B.C.), they were often deposited in hollow wooden figures of the god Ptah Socharis Osiris, or of the god Osiris, which were placed near the mummies. Papyri of a civil nature were deposited in jars or boxes, which were placed near the mummies, or have been found in the remains of ancient libraries. The following are the principal kinds of Egyptian papyri: I. Hieroglyphical papyri, always accompanied by pictures or vignettes, and consisting of three classes: 1. Solar litanies or texts, and pictures relating to and describing the sun's passage through the hours of the night, when that luminary was supposed to enter the Egyptian hades or hell. 2. Books of the empyreal gate, or heaven, with vignettes of deities, and other representations referring to the genesis of the cosmos or universe. 3. The so-called ritual, consisting of a series of sacred or hermetic books, some of a very remote antiquity, accompanied with rubrical titles and directions as to their efficacy and employment, and comprising various formulas ordered to be placed on the coffins, amulets, and other furniture of the dead, for the better preservation of the souls of the dead and of the mummies in the future state. In this book, chapters giving an account of the future judgment, of the *makhenu*, or boat of the dead, of the Elysian Fields, and of the halls through which the dead had to pass are also found. The work was considered by the Egyptians themselves mystic, and parts were supposed to be written by the god Thoth himself. A copy more or less complete, according to the wealth of the deceased, was deposited with all the principal mummies; and from the blank spaces left for the name, which were afterwards filled up, it is evident that they were kept ready made.—II. Hieratic papri, written in the hieratic or cursive Egyptian hand, comprising a more extensive literature than the hieroglyphic papyri. This handwriting being used for civil as well as religious purposes, the papyri found in it differ considerably from one another, and comprise rituals of the class already mentioned, principally in use about the 26th dynasty, or the 6th c. B.C., but found also on some few papyri of a remote period; a book called the *Lamentations of Isis;* magical papyri, containing directions for the preparation of charms and amulets, and the adjuration of deities for their protection; civil documents, consisting of the examination of persons charged with criminal offenses, the most remarkable of which are that of an offender charged with the practice of magic in the 19th dynasty, another of a criminal charged with various crimes in the reign of Sethos I., the examination of a conspiracy in the palace of Rameses II., and the *procèsverbal* of an offender charged with violating the sepulchres of the kings in the reign of Rameses IX. Besides these, there are several letters of various scribes upon subjects connected with the administration of the country and private affairs; laudatory poems of Egyptian monarchs, one describing the campaign of Rameses II. against the Khita or Hittites; historical documents, the journeys in foreign parts; the endowment of temples by Rameses III.; works of fiction, one of the adventures of two brothers, the death of the younger, owing to the false accusation of the wife of the elder, his revival and transformation into a bull and a Persea tree; another, the story of a doomed prince, and the adventures of different persons. Works on plants and medical subjects, books of proverbs, lists of kings, historical accounts, are amongst these documents.—III. The last class of Egyptian papyri, those written in the demotic or enchorial character, consist of rituals, contracts for the sale of mummies and lands, accounts and letters, and miscellaneous documents. These papyri are often bilingual, sometimes accompanied with hieratic or Greek versions. Many of these papyri have been translated by de Rougé, Chabas, Heath, Goodwin, Birch, and others. Many Greek papyri have been found belonging to the archives of the Serapeion, referring to the administration of that temple, the orations of Hypereides, and some of the books of Homer. At all times in the history of Egypt, libraries of papyri seem to have existed, and, under the Ptolemies, are said to have contained as many as 700,000 rolls.

Another class of ancient papyri, those of Pompeii and Herculaneum, are of considerable interest, as showing the condition and arrangement of a Roman library. The papyri of Herculaneum are from 8½ to 12¾ in. wide, and are rolled up in a cylindrical roll, *volumen*, upon a stick or inner roll, *bacillus, umbilicus*, having a stud at the end, *cornu*. They had their titles written on a strip, *lorum*, in red letters, and the writing was either on blind lines, or else on lines ruled with lead. About 1800 papyri were discovered at Herculaneum in 1753, in the library of a small house, charred to a cinder, and some of these, by the greatest skill and care, have been unrolled by a very laborious

process at Naples. Unfortunately, they have not answered the literary expectations formed of them, consisting of the works of philosophers of the Epicurean school, which the proprietor of the library seems to have collected. Some of the papyri were in Latin, and more difficult to unroll. Many of them have been published. They are only written on one side. When a small number were required, they were placed in a cylindrical bronze chest (*cista*), packed tightly in a perpendicular position, and were taken out single, and read by unrolling from one end. These papyri were of various prices; old ones, like old books, being of immense value, but those containing the works of contemporary authors were not dearer, perhaps, than modern books. Many extensive private and public libraries existed in Greece and Rome, but all have perished except those exhumed from Herculaneum.

Wilkinson, *Man. and Cust.* iii. 62, 147, 188, v. 482; Winckelmann, ii. Bd. i. 1; Chabas, *Pap. d'Harris* (Chalon, 1860); *Papyrus Hieratiques* (8vo, Chalon, 1863); *Voyage d'un Egyptien* (1866); Pleyte, *Papyrus de Turin* (1869–74); *Cambridge Essays* (1858), p. 227; De Rouge, *Rev. Contemp.* xxvii. p. 389; Devena, *Papyrus Judicione de Turin* (1868); *Trans. Soc. Bibl. Arch.* (1874).

PAPY'RUS, a genus of plants of the natural order *cyperaceæ*, of which there are several species, the most important being the Egyptian Papyrus or *papyrus* of the ancients (*P. antiquorum, cyperus papyrus* of Linnæus); a kind of sedge, 8 to 10 ft. high; with a very strong, woody, aromatic, creeping root; long, sharp-keeled leaves; and naked, leafless, triangular, soft, and cellular stems, as thick as a man's arm at the lower part, and at their upper extremity bearing a compound umbel of extremely numerous drooping spikelets, with a general involucre of 8 long filiform leaves, each spikelet containing 6–13 florets. By the ancient Egyptians it was called *papu*, from which the Greek *papyrus* is derived, although it was also called by them *byblos* or *deltos*. The Hebrews called it *gomé*, a word resembling the Coptic *gom*, or volume; its modern Arabic name is *berdi*. So rare is the plant in the present day in Egypt, that it is supposed to have been introduced either from Syria or Abyssinia; but it has been seen till lately in the vicinity of the lake Menzaleh, and specimens sent to England; and, as it formerly was considered the emblem of northern Egypt, or the Delta, and only grown there if introduced, it must have come from some country lying to the north of Egypt. It has been found in modern times in the neighborhood of Jaffa, on the banks of the Anapus, in the pools of the Liane, near Syracuse, and in the vicinity of lake Thrasymenus. It is represented on the oldest Egyptian monuments, and as reaching the height of about 10 ft. It was grown in pools of still water, growing 10 ft. above the water, and 2 beneath it, and restricted to the districts of Sais and Sebennytus. The papyrus was used for many purposes both ornamental and useful, such as crowns for the head, sandals, boxes, boats, and cordage, but principally for a kind of paper called by its name. Its pith was boiled and eaten, and its root dried for fuel. The papyrus or paper of the Egyptians was of the greatest reputation in antiquity, and it appears on the earliest monuments in the shape of long rectangular sheets, which were rolled up at one end, and on which the scribe wrote with a reed called *kash*, with red or black ink made of an animal carbon. The process of making paper from the papyrus is described in the article Paper. When newly prepared, it was white or brownish white and lissom; but in the process of time, those papyri which have reached the present day have become of a light or dark brown color, and exceedingly brittle, breaking to the touch. While papyrus was commonly used in Egypt for the purposes of writing, and was, in fact, the paper of the period, although mentioned by early Greek authors, it does not appear to have come into general use among the Greeks till after the time of Alexander the great, when it was extensively exported from the Egyptian ports under the Ptolemies. Fragments, indeed, have been found to have been used by the Greeks centuries before. It was, however, always an expensive article to the Greeks, and a sheet cost more than the value of a dollar. Among the Romans, it does not appear to have been in use at an early period, although the Sibylline books are said to have been written on it, and it was cultivated in Calabria, Apulia, and the marshes of the Tiber. But the staple was no doubt imported from Alexandria, and improved or adapted by the Roman manufacturers. So extensive was the Alexandrian manufactory that Hadrian, in his visit to that city, was struck by its extent; and later in the empire, an Egyptian usurper (Firmus, 272 A.D.) is said to have boasted that he could support an army off his materials. It continued to be employed in the eastern and western empire till the 12th c., and was used amongst the Arabs in the 8th; but after that period it was quite superseded by parchment. At the later periods it was no longer employed in the shape of rolls, but cut up into square pages, and bound like modern books.

As a matter of scientific interest, experiments on the manufacture of paper from the papyrus have been made in recent times by Landolina, Seyffarth, and others.—Another species of papyrus (*P. corymbosus* or *P. Pangorei*) is much used in India for mats. See Mat. See illus., Grain, etc., vol. VI.

PAR, or Parr, a small fish, also called Brandling and Fingerling in different parts of Britain, inhabiting rivers and streams, and at one time believed to be a distinct species of the genus *salmo*, but now almost universally regarded as the young of the salmon. The question will be noticed in the article Salmon. It may here, however, be

mentioned, that it is difficult to discriminate the young of different species of this genus. The par rises with extraordinary readiness to the artificial fly; and until it began to receive protection as the fry of the salmon vast numbers were killed both by youthful and adult anglers.

PARA′, the name of the s. arm of the Amazon, forming an outlet for that river into the Atlantic; on the southern side of the island of Marajo (q.v.). It is 200 m. in length, is 20 m. broad opposite the city of Para, and is 40 m. broad at its mouth. Its most important affluent, and the source whence it draws, perhaps, the great mass of its volume of waters, is the Tocantins. Formerly, the name Para, which is said to signify "father of waters," was applied in a general way to the river Amazon. At the time of the spring-tides, the *bore* rushes up the river with enormous force, forming a wave sometimes as much as 15 ft. high.

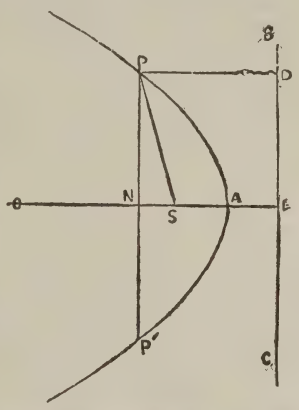
PARA′, an important state of the republic of Brazil, in the extreme n. of the country, is bounded on the n. by Guiana and the Atlantic, on the e. by Maranhao and Goyaz, on the s. by Matto Grosso, and on the w. by Amazonas. Area, 443,653 sq. m.; pop. '90, 889,821. It is one of the largest provinces of Brazil—having an area nearly twice the extent of Austria—is watered by the Amazon and its great affluents the Tapajos, Xingu, and Tocantins; and forms a portion of a district—the Amazon valley—which has been described by the most thorough explorer of this region as unequaled for richness of vegetable production and fertility of soil. The surface of the country is level, and consists of great plains, intersected by rivers, and covered with primeval forests, and in some cases with rich pasture. The climate, though warm, is not unhealthy. The precious metals, with diamonds, iron, and coal, are found, but are not worked. The timber is valuable, and the chief crops raised upon the very limited area as yet brought under cultivation are coffee, rice, millet, and cotton, cacao, and sugar.

PARA′, or BELE′M, a thriving town and seaport of Brazil, capital of the province of the same name, stands on the e. bank of the river Para, 80 m. from its mouth. Lat. 1° 27′ s., long. 48° 30′ west. The harbor is formed by an abrupt curve or inlet of the channel of the river, which is here 20 m. broad. Vessels of the largest size are admitted; the anchorage is roomy, safe, and easy of access. The streets are paved and macadamized; the houses, like those of most Brazilian towns, have whitened walls and red-tiled roofs. Among the principal buildings are the palace of the president, the cathedral, built in 1720, and the churches, all ample in size, and imposing in structure. There are also numerous public squares, a college, a beautiful botanic garden, a museum, theater, public library, etc. The "Amazon navigation company," a Brazilian association, subventioned by the government, has erected large workshops, coal depots, and wharves; and steam navigation is rapidly extending both on the Amazon and on the Tocantin. Steamship lines connect Para with Europe and North America. In 1896 a cable was laid between Para and Manaos. Trade with the U. S. is extensive. The imports are principally cotton manufactures, wheat and flour, cutlery and hardware, wool, gold and silver wares, coins and wine. The exports are india-rubber, coffee, sugar, raw cotton, hides, tobacco, diamonds, and cocoa. Pop. '92, 65,000. Para is the mart through which passes the whole commerce of the Amazon and its affluents. The city stands on the site of an old Portuguese fort founded in the early part of the seventeenth century. Soon after the fort was built, the Capuchins established a mission near by. Para was the seat of revolution during the whole of the year 1835, when a great number of lives were lost and houses destroyed, and grass grew in streets that previously had been the center of business. It is only since the year 1848 that the city can be said to have fairly entered upon the path of orderly commercial progress; and since that period, its advance has been continuous and rapid.

PARA′, a coin of copper, silver, or mixed metal, though most generally of copper, in use in Turkey and Egypt; it is the 40th part of a piaster, is divided into 3 aspers, and varies much in value, owing to the debased and complicated condition of the Turkish coinage. Pieces of 5 paras are also in use. The para is equal to about one mill in Turkey, and a little more in Egypt. See PIASTER.

PARABLE, (Gr. *parabolé*, a comparison) was originally the name given by the Greek rhetoricians to an illustration avowedly introduced as such. In Hellenistic and New Testament Greek, it came to signify an independent fictitious narrative, employed for the illustration of a moral rule or principle. This kind of illustration is of eastern origin, and admirable examples are to be found in the Old and New Testaments, particularly in the discourses of our Lord. It is no less interesting than curious to learn that many of Christ's parables, or at least much of his parabolic imagery, are to be found in the writings of Hillel, Shammai, and other great rabbis, as, for example, the parables of the Pearl of Great Price, the Laborers, the Lost Piece of Money, the Wise and Foolish Virgins, etc. Among modern writers, the German divine Krummacher (q.v.) has greatly distinguished himself in this species of composition. The parable differs from the fable (q.v.) in the probability or verisimilitude of the story itself, and agrees with it in the essential requisites of simplicity and brevity. In the course of time, the word parable came to lose its significance of figurative speech, and to mean speech generally. From the *parabola* of the Latin Vulgate, came the mediæval Latin *parabolare*, whence the modern French *parler* and *parole*. An excellent work on the parables of the New Testament —probably the best in the English language—is that by Archbishop Trench.

PARAB'OLA, one of the conic sections, is produced by a plane not passing through the vertex, which cuts the cone in a direction parallel to that of a plane touching the convex surface of the cone. A little consideration will show that a section so produced cannot be a closed curve, but its two branches, though continually widening out from each other, do not diverge so rapidly as in the hyperbola (q.v.). The nearer the cutting plane is to that which touches the cone, the less do the two branches diverge; and when the two planes coincide, the branches also coincide, forming a straight line, which is therefore the limit of the parabola. It may otherwise be considered as a curve, every point of which is equally distant from a fixed straight line and a given point; the fixed straight line is called the *directrix*, and the given point the *focus*. Thus (see fig.) PAP is a parabola, any point P in which is equally distant from the focus S and the directrix CB, or PS = PD. If, from S, a perpendicular, SE, be drawn to the directrix, and produced backward, this line, AO, is the *axis* or *principal diameter* of the parabola, and the curve is symmetrical on both sides of it. As A is a point in the parabola, AS = AE, or the *vertex* of a parabola bisects the perpendicular from the focus to the directrix. All lines in a parabola which are parallel to the axis cut the curve in only one point, and are called *diameters*. All lines, such as PP', which cut the curve in two points, are ordinates, and the diameter to which they are ordinates, is that one which bisects them; the portion of this diameter which is intercepted between the ordinate and the curve, is the corresponding abscissa. From the property of the parabola that PS = PD, the equation to the curve may be at once deduced; for PS = PD = EN, therefore PS^2 (which $= PN^2 + NS^2$) $= EN^2$; hence $PN^2 = EN^2 - NS^2 = (ES + SN)^2 - NS^2 = ES^2 + 2$ ES.SN = (since ES = 2AS) $4AS^2 + 4AS.SN = 4AS$ (AS + SN) = 4AS.AN; and calling PN, the semiordinate, y; AN, the abscissa, x; and AS, a; the equation to the parabola becomes $y^2 = 4ax$, where a (the distance of the vertex from the focus) remains the same for all points in the same curve. It is evident from the equation, as well as from the geometrical derivation of the parabola, that it must have two, and only two branches, and that the further it is extended the nearer its branches approach to the condition of straight lines parallel to the axis, though they never actually become so. The parabola has no asymptotes, like the hyperbola, but it possesses many properties which are common to it with that curve and the ellipse. In fact, the parabola is nothing more than an ellipse, whose major axis is infinitely long.



If parallel rays of light or heat fall upon the concave surface of a paraboloidal (see PARABOLOID) mirror, they are reflected to the focus, and conversely, if a light be placed in the focus of a paraboloidal reflector, its rays will be reflected in parallel directions, and would appear equally bright at all distances did light move without deviation, and unabsorbed. Also, if a body be projected in a direction not vertical, but inclined to the direction of gravity, it would, if undisturbed by the resisting force of the atmosphere, describe accurately a parabola whose axis is vertical, and whose vertex is the highest point reached by the body (see PROJECTILES).

The term parabola is used in analysis in a general sense, to denote that class of curves in which some power of the ordinate is proportional to a lower power of the abscissa. Thus, the curve we have just described, and which is distinguished as the *common* or Apollonian parabola, has the square of its ordinate proportional to its abscissa; the *cubical* parabola has the cube of its ordinate proportional to its abscissa; and the *semicubical* parabola has the cube of its ordinate proportional to the square of its abscissa.

PARABOLA'NI (Gr. *parabolos*, a desperate person), a class of functionaries in the early church, by some writers reckoned as members of the clergy, and included in the ranks of the minor orders, but more probably religious associations, whose duty it was to assist the clergy, especially in the more laborious and the menial offices of religion or of charity. The etymology of the name is somewhat curious, being derived or applied from that of those desperate adventurers of the arena who hired themselves for the wild-beast fights of the amphitheater. The chief duty of the parabolani was the tending of the sick, whether in ordinary diseases or in times of pestilence. By some, the association is believed to have originated at Alexandria, and perhaps to have been peculiar to that church; but although the parabolani were certainly very numerous at Alexandria, amounting to some 500 or 600, it is beyond all question that they were also enrolled in other churches. We find them at Ephesus, at the time of the council in 449. They held the same place in regard of ministrations to the living, that the *fossores* of Rome or the *kopiatai* of the Greeks did in relation to the burial of the dead. The parabolani are made the subject of formal legislation by Theodosius the younger. At first they were subject to the præfectus Augustalis, but a later decree placed them directly under the authority of the bishop.

The name parabolani must not be confounded with the epithet *parabolarius*, which the pagans applied to the Christian martyrs, from the recklessness with which they gave their lives for their faith.

PARAB'OLOID, a solid figure traced out by a parabola (q.v.) revolving round its principal axis. Sections of this solid parallel to the principal axis are parabolas, and those perpendicular to it, circles. The term "paraboloidal," for which "parabolic" is frequently but improperly substituted, is applied either to bodies having the form of a paraboloid, or to concave surfaces which seem to have taken their peculiar hollow shape from the impress of a paraboloidal body.

PARACEL'SUS. About the end of the 15th c. there lived in the small town of Marien-Einsedeln, near Zurich in Switzerland, William Bombast von Hohenheim, a physician and chemist; he was married to the lady-superintendent of the hospital attached to the convent of Einsedeln; they had an only son, Philip Aureolus Theophrastus, born, it is thought, about 1493. The name Paracelsus, by which he is now known, is a rude rendering into Greek and Latin of his patronymic. It seems doubtful if he ever attended any regular school, but he received from his father the rudiments of Latin and whatever else he could teach. He soon took to roaming, and even pursued his travels into Asia and Africa. How he maintained himself during his pilgrimage is unknown; probably by necromancy and quack cures—that is, proclaiming he had certain specifics, and bargaining for the amount he was to receive if he performed a cure. He was a diligent chemist, investigating the processes of the preparation of metals, and making experiments as to their medicinal virtues; also to discover the philosopher's stone. As a chemist he lived with Sigismund Fugger, one of a family celebrated for its patronage of art and science. His cures, real or pretended, became noised abroad, and he was called to prescribe for all the great men of his day. When he was thirty-three, he boasted of having cured thirteen princes, whose cases had been declared hopeless. He was then at his zenith and at the recommendation of Œcolampadius was appointed professor of physic and surgery at Basel. He commenced his academic career by publicly burning Galen's works, exclaiming Galen did not know as much as *his* shoe-latchets. "Reading never made a physician," he said; "countries are the leaves of nature's code of laws—patients his only books." His class-room at first was full to overflowing, but was soon deserted, and he fell into habits of excessive intemperance; indeed his secretary asserts he was drunk every day; never undressed, and went to bed with his famous sword by his side, which he would draw, and flourish about the room. The reason of his departure from Basel was, that a certain dignitary, suffering from gout, in his agony sent for Paracelsus, and promised to give him 100 florins if he cured him. Paracelsus gave him three *laudanum* pills; the canon felt comfortable, and the doctor claimed his fee, but the churchman refused to pay. Paracelsus took him into court, but the judge decided against the professor, who lost his temper, and abused the legal functionary in such a manner that the matter was taken up by the town council, and ended in the expulsion of Paracelsus. He recommenced his wanderings. Wherever he went he excited the regular faculty to a state of violent hatred, not wholly undeserved. At Salzburg he had given offense in the usual way, and the result was, "he was pitched out of the window at an inn by the doctor's servants, and had his neck broken by the fall." This took place in 1541.

That a man whose life was such an incoherent medley should exert an influence for centuries after his death, may well be a matter of surprise, but he and the age were fitted for each other. He struck the weak point of the prevailing system of medicine; he appealed to the public as to whether it were not a false system that could only lead to failure, and he proposed a system of his own, which, though shrouded in absurdity and obscurity, inaugurated a new era of medicine. The prominent idea of his system is, that disease does not depend upon an excess or deficiency of bile, phlegm, or blood, but that it is an actual existence, a blight upon the body subject to its own laws, and to be opposed by some specific medicine. See the works of Paracelsus; also of Schulz (1831); Lessing (1839); Mook (Würzb. 1876); and Russell (*History and Heroes of Medicine*, 1861).

PARACHUTE (Fr. *chute*, a fall), a machine invented for the purpose of retarding the velocity of descent of any body through the air, and employed by aëronauts as a means of descending from balloons. It is a gigantic umbrella, strongly made, and having the outer extremities of the rods, on which the canvas is stretched, firmly connected by ropes or stays to the lower part of the handle. The handle of the parachute is a hollow iron tube, through which passes a rope connecting the balloon above with the car (in which are the aëronauts and their apparatus) beneath, but so fastened, that when the balloon is cut loose, the car and parachute still remain connected. When the balloon ascends, the parachute collapses like an umbrella; but when the balloon rope is severed, and the car begins to descend, the parachute is extended by the action of the air, and prevents the car from acquiring a dangerous velocity of descent; the final velocity in those cases where the machine is of a size proportioned to the weight it has to support, being no more than would be acquired by a person leaping from a height of between two and three feet. But the slightest derangement of the parachute's equilibrium, such as might be caused by a breath of wind, or the smallest deviation from perfect symmetry in the parachute itself, immediately produces an oscillatory motion of the car, hav-

ing the apex of the parachute as a center, and the oscillations becoming gradually greater and more rapid, the occupants of the car are in most cases either pitched out or are along with it dashed on the ground with frightful force. This defect in the parachute has been attempted to be remedied in various ways, but hitherto without success. The first successful experiment with the parachute was made by Blanchard at Strasburg in 1787, and the experiment has been often repeated by Garnerin and others; very frequently, however, with fatal results. See illus., BALLOONS, vol. II., figs. 9, 10.

PARACLETE (Greek, *parakletos*, an advocate, and in the authorized version translated "Comforter"), is a name applied to Christ in 1 John ii., 1, and by Christ, to the Holy Spirit in John xiv., 16, as the Advocate and Comforter of mankind. In the early ages, many believed that the Paraclete would appear personally on the earth, and Simon Magus, Manes, Montanus and some others pretended to be the expected Paraclete. See MANI and MONTANUS.

PARADE (from *parare*) signified in its original sense a prepared ground, and was applied to the courtyard of a castle, or to any enclosed and level plain. From the practice of reviewing troops at such a spot, the review itself has acquired the name of parade. In its modern military acceptation, a *parade* is the turning out of the garrison, or of a regiment in full equipment, for inspection or evolutions before some superior officer.

PARADISE. See EDEN.

PARADISE, BIRD OF. See BIRD OF PARADISE.

PARADISIDÆ, a family of birds very closely allied to the crow family (*corvidæ*). These birds are particularly numerous in the island of New Guinea, but also inhabit other islands of the eastern archipelago. They are by common reputation the most beautiful of all birds, especially in regard to their plumage. Fiction credits them with passing their entire existence floating about, "gay creatures of the element" in which they were supposed to raise their young. Their food was said to be the dews and vapors, a sort of heavenly ambrosia and nectar. They were supposed never to touch the earth till the moment of their death, except that sometimes they suspended themselves from the branches of trees by the two elongated and gracefully curved feathers which are appended to the tails of some of the species. This delusion was kept up by the Papuans, who sold the skins, but in preparing them removed all traces of the feet or lower parts of the legs, and in most instances the wings also. Their skins were not only valued for their gorgeous beauty, but eastern princes prized them for turbans, believing that they conferred a charmed life on the wearer. The earliest European navigators who sailed to the Molucca islands for spices, obtained the dried skins of the birds of paradise which were called by the natives *manuk dewata*, or God's birds. John van Linschoten in 1596 wrote that no one had seen the birds alive, "for they lived in the air, always turning towards the sun, and never alighting till their death," saying, moreover, that they have neither feet or wings. It was a long time before the assertions of sensible observers and naturalists would be credited that birds of paradise had legs. Johnston, in 1657, writes of them: "It is peculiar to them all to be without feet, although Aristotle asserts that no bird is without feet, and Pigafetta assigns to them feet a hand breadth in length." This was written after Clusius had exposed the popular absurdity, and after the skins or the birds had been brought to Holland with their feet on, and after the publication of Tradescant's catalogue, wherein are mentioned among the *whole birds* of his museum "Birds of Paradise, or Manucodiata, whereof are divers sorts, some with, some without leggs." Johnston, however, discredits the stories about their never alighting, and living on dew, and that their eggs are hatched in a cavity on the back of the male. "Of a verity," says he, "they must necessarily require rest, and are with ease suspended to the branches of trees by those threads in their tails." Formerly, many artificial "birds of paradise" were made up by the Chinese, from parrots and other birds of brilliant plumage and palmed off on Europeans as genuine, and such imitations have been figured in books of natural history. The great bird of paradise (*paradisea apoda* of Linnæus) is the largest species, and measures 17 or 18 in. from the beak to the tip of the tail. Its body, wings, and tail are of a rich coffee brown, deepening on the breast to a very dark violet purple. The plumage of the head and neck is of the most beautiful and delicate straw color, the feathers so short and close as to resemble velvet. The lower part of the throat is of a metallic emerald, and lines extend up to the eyes and across the forehead of a deeper color. The beak is of a delicate leaden blue, and the feet, which are strong and finely formed, are of a delicate ash pink, approaching a mauve. A tuft of long, gorgeous, glossy, orange-colored plumes, often 2 ft. long, arises from each side of the body under the wings. The bird has the power of erecting these tufts of plumage so as to conceal its entire body. These ornaments are generally possessed only by the males, the female being soberly clad in a suit of unchangeable coffee brown; neither has she the slender thread-like tail plumes, nor the yellow and green feathers about the head. During the first year the young males resemble the females. The first approach to decoration is in the appearance on the head and neck of the yellow and green plumage; then the two middle tail feathers commence to grow longer than the rest, and lastly the

gorgeous, golden, orange-colored side-plumage is developed. This wonderful evolution is accomplished during three successive moltings. The great bird of paradise is described by Mr. Wallace as very active and vigorous, being all day in constant motion. They are also very abundant, and broods of young birds with their mothers are constantly met with. The full-plumed males are also quite numerous, and their cry, *wauk, wauk,* which may be regarded as the inverted cry of the common crow, *caw, caw,* is perhaps the most familiar sound in the Aru islands. The natives told Mr. Wallace that they had never seen the egg, and their accounts of the nests were rather unsatisfactory. On one occasion a Dutch official offered a high reward for an egg, but did not succeed in obtaining one. The birds molt in January and February; and in May, when they have received their full plumage the males assemble for the annual dance, or *sćaleli.* They congregate in trees with large spreading branches, but with scattered leaves to allow room for the play of their plumage. A dozen or more assemble in one tree and perform in an excited manner the most varied evolutions, stretching their necks, vibrating their wings and all the feathers of the body. They also fly from one branch to another, filling the air with reflections of the most gorgeous rainbow colors. It is during this season that the natives take the opportunity of shooting them with the bow and arrow, the head of the arrow being blunt so as only to stun the bird and not to injure its skin or plumage. The lesser bird of paradise is smaller, of a lighter brown color, and is not purple on the breast. The yellow color extends over part of the back and upon the wings, and the side plumes are of a much paler yellow than those of the great bird, the ends tipped with white. The curled tail feathers are also shorter. The female is entirely white on the under surface of the body, and is a more showy bird than the female of the great bird species. The red bird of paradise is about 14 in. long from beak to tip of tail. Its side plumes are a splendid crimson, the ends reaching but about 4 in. beyond the tail, curving downward and inward, and tipped with white. The two middle tail feathers are in the form of stiff black ribbons a quarter of an inch in width, resembling half-cylinders of whalebone. They are about 22 in. long and have a spiral, graceful curve as they hang downward in their natural position. A splendid metallic green line passes from the throat along the side of the neck, meeting and forming a longitudinal line on the back of the head, passing forward to just behind the eyes, and forming a double crest upon the forehead. The bill is a rich yellow, and the iris blackish olive. The body of the female is of a nearly uniform coffee brown, with a nearly black head and yellow neck and shoulders. The red bird of paradise is entirely confined to the small island of Waigiou, on the n.w. coast of New Guinea. The three birds thus far described are distinguished from the others by their larger size, and by their being each confined to its own region; that is, each of the three keep separate from the other two. To these strictly belong, according to Mr. Wallace, the generic title *paradisea,* or true bird of paradise. The king bird of paradise (the *paradisea regia* of Linnæus), differs considerably from the three true birds of paradise, and has been called *cicinnurus regius.* The Malays call it *burong rajah,* or king bird, and the Aru islanders, *goby-goby.* It is only about 6½ in. long, owing much to the short tail, which does not reach far beyond the wings. The whole head, throat, and back, are of the most splendid crimsom color, shading to orange crimson on the forehead, from which the feathers extend more than half way down the beak. The breast and belly are of a pure white, separated from the crimson throat by a broad band of the richest metallic green; while above each eye there is a small spot of the same color. The side plumes are about and inch and a half long, of an ashy hue, tipped with emerald, and bordered with a narrow line of buff. These tufts are ordinarily covered by the wings, but at will can be spread out so as to form a beautiful semi circular fan over each shoulder. The most singular ornaments, however, belonging to this bird are the two central tail feathers which are nearly 6 in. long, thread-like, and bearing a coiled disk at their extremities of an emerald green. The bill is orange yellow, and the legs a beautiful cobalt blue. The female is so plain that it would not be regarded as belonging to the same species, unless its habits were watched. The "magnificent bird of paradise," the *diphyllodes* of prince Bonaparte, so named from the double mantle which clothes the back, is one of the rare birds. From the nape a dense mass of feathers, about 1½ in. long, and of a beautiful straw color, rises to form a mantle over the upper part of the back. This species is only found on the mainland of New Guinea and on the island of Mysol. The "superb bird of paradise," first described by Buffon, and named by Broddaert, *paradisea atra,* has very dark plumage, and is one of the rarest and most brilliant, only known by the mutilated skins sold by the natives. The ground color of the plumage is of an intense black, but the various bronze and other metallic reflections over various parts of the neck and body are especially superb. The whole head is covered with feathers of a brilliant metallic green and blue. It has a mantle similar to that of the "magnificent," only broader and more wing-like, of a velvety black, resplendent with bronze and purple. On the breast there is also a similar shield, but inverted in position, of a bluish green, and satin gloss. It inhabits the interior of northern New Guinea only. Mr. Wallace gives a list of 18 species, 8 of which are confined to the island of New Guinea, and the scarcely separated island of Salwatty. See Bird of Paradise.

PARADOS—another name for traverse—is an intercepting mound, erected in various parts of a fortification for the purpose of protecting the defenders from a rear or ricochet fire. See Fortification.

PARADOX (Gr. *para*, beside, or beyond, and *doxa*, an opinion), a term applied to whatever is contrary to the received belief. Cicero, in his book on paradoxes, states that the Stoics called by this name all those unusual opinions which contradict the notions of the vulgar. It follows from this that a paradox is not necessarily an opinion contrary to truth. There have been bold and happy paradoxes whose fortune it has been to overthrow accredited errors, and in the course of time to become universally accepted as truths. It is, perhaps, even one of the prerogatives of genius to bring such into the world, and thereby to alter the character of an art, a science, or a legislation; but this, the highest form of paradox, which is only another name for originality of thought, or for novelty of scientific discovery, is rare. The paradox which springs from a passion for distinction and which, in its efforts to achieve it, despises good sense and the lessons of experience, is far more frequent. It may not be at bottom a positive error in thought, but it is so exaggerated in expression, that if taken literally it actually does mislead. This is the besetting sin of the brilliant and epigrammatic class of writers, abundant examples of which are to be found in modern French literature.

PAR'AFFINE is the name given to several closely allied substances, which are composed of mixtures of polymeric hydrocarbons, of the marsh gas series (that is to say, of the formula C_nH_{2n+2}), and are obtained from the dry distillation of wood, peat, bituminous coal, wax, etc. P. is particularly abundant in beech tar, but, according to Reichenbach, to whom its name (which is formed from *parum affinis*, "little allied," in consequence of its resisting the action of the strongest acids and alkalies) is due, and who may be regarded as its discoverer; it is also found in the tar of both animal and vegetable substances. At ordinary temperatures P. is a hard, white, crystalline substance, devoid of taste or odor, and resembling spermaceti, both to the touch and in appearance. P. obtained from wood fuses at about 111° F. (44° C.), but the varieties obtained from other substances have considerably higher boiling-points. When carefully heated, it sublimes unchanged at a little below 700° F. (371° C.). It dissolves freely in hot olive-oil, in oil of turpentine, in benzol and ether, but is only slightly soluble in boiling alcohol, and quite insoluble in water. It does not burn readily in the air, unless with the addition of a wick, when it evolves so brilliant and smokeless a flame that it has been applied to the manufacture of candles, which rival those made of the finest wax. The main supply of the paraffine of commerce is obtained in Gt. Britain, from the Boghead cannel-coal, and from the bituminous shale of West Caldar. See NAPHTHA. A bituminous shale near Bonn supplies much of the continental demand. Much of that used in the U. S. comes from Bradford, Penn. It is used for confectionery and chewing-gum; for the insulation of electric wires; as a coating for the paper in which hardware and cutlery are wrapped, and for the inside of beer barrels; and for the manufacture of wax flowers.

PARAFFINE OIL is the term applied to the oily matter which is given off in large quantity in the distillation of Boghead cannel-coal. By rectification it may be separated into three portions, one of which remains liquid at very low temperatures, boils at about 420° F. (215.5° C.), and is much used under a variety of names for illuminating purposes, while a mixture of the two less volatile portions (which may be regarded as composed of paraffine dissolved in a mixture of hydrocarbons of nearly the same composition as paraffine) is largely employed for the purpose of lubricating machinery, for which it is admirably adapted by its power of resisting the oxidizing action of the atmosphere, and by its very slow evaporation. See NAPHTHA.

PARA GRASS. See PIASSABA.

PARAGUAY, an important river of South America, an affluent of the Parana (q.v.), rises in the Brazilian province of Matto Grosso, on a plateau of red sandstone, in lat. 13° 30′ s., long. about 55° 50′ w., 9,535 ft. above sea-level. The sources of the river are a number of deep lakes, and 8 m. from its source the stream already has considerable volume. Pursuing a s.w. course, and, after flowing through a level country covered with thick forests, the Paraguay is joined from the w. by the Jauru, in lat. 16° 30′ south. It then continues to flow s. through the Marsh of Xarayes, which, during the season when the stream rises, is an expansive waste of waters, stretching far on each side of the stream, and extending from n. to s. over about 200 miles. The river still pursues a circuitous but generally southward course, forming from 20° to 22° s. the boundary-line between Brazil and Bolivia, thence flowing s.s.w. through the territories of Paraguay to its junction with the Parana, in lat. 27° 17′ s., a few m. above the town of Corrientes. Its chief affluents are the Cuyaba, Tacoary, Mondego, and Apa on the left, and the Jauru, Pilcomayo, and Vermejo on the right. Except in the marshy districts, the country on both banks of the river is rich and fertile, and abounds in excellent timber. The entire length of the river is estimated at 1500 miles; but counting in the lower Parana and the Plata the length would probably be about 2580 m. The waters of the Paraguay, which are quite free from obstructions, were declared open to all nations in 1858; and now Brazilian mail-steamers ply monthly between Montevideo and Cuyaba, on the river of the same name, one of the head-waters of the Paraguay; and there are several lines of steamers between Buenos Ayres and Asuncion.

PARAGUAY', a republic of South America. Its frontiers, previous to the war of 1865–70, were not well defined, but on its conclusion were fixed by treaty. Paraguay now extends from 20° 10′ 14″ to 27° 31′ s. lat., and from 54° 37′ to 62° w. long., forming the peninsula between the rivers Paraguay and Parana. It is bounded n. and n.e. by Brazil, s.e., s., and s.w. by the Argentine confederation, and n.w. by Bolivia. Its area previous to the war of 1865–70, was about 103,148 square miles, and is now officially reported at 91,970 square miles. Before the war, the population was variously estimated at from 450,000 to 1,300,000, consisting of whites of Spanish descent, native Indians, negros, etc. In 1873 it had fallen to 221,079; in 1887 it was 329,645; in 1895 it was estimated at 432,000. A mountain-chain called Sierra Amambay, running in the general direction of from n. to s., and bifurcating to the e. and w. towards the southern extremity, under the name of Sierra Maracayu, divides the tributaries of the Parana from those of the Paraguay, none of which are very considerable, although they are liable to frequent and destructive overflows. The northern portion of Paraguay is in general undulating, covered by low, gently-swelling ridges, separated by large grass plains, dotted with palms. There are mountains in the n.e. and n.w. corners. The southern portion is one of the most fertile districts of South America, consisting of hills and gentle slopes richly wooded, of wide savannas, which afford excellent pasture-ground, and of rich alluvial plains, some of which, indeed, are marshy, or covered with shallow pools of water (only one lake, that of Ypao, deserving special notice), but a large proportion are of extraordinary fertility and highly cultivated. The banks of the rivers Parana and Paraguay are occasionally belted with forest; but, in general, the low lands are destitute of trees. The climate, for a tropical country, is temperate, the temperature occasionally rising to 100° in summer, but in winter being usually about 45°. In geological structure, the southern part belongs generally to the tertiary formation; the n. and e. presenting greywacke rocks in some districts. The natural productions are very varied, although they do not include the precious metals or other minerals common in South America. Much valuable timber is found in the forests, and the wooded districts situated upon the rivers possess a ready means of transport. Among the trees are several species of dye-wood, several trees which yield valuable juices, as the India rubber and its cognate trees; and an especially valuable shrub, called the *Máté* (q.v.), or Paraguay tea-tree, which forms one of the chief articles of commerce, being in general use throughout La Plata, Chili, Peru, and other parts of South America. The tree grows wild in the north-eastern districts, and the gathering of its leaves gives employment in the season to a large number of the native population. Many trees also yield valuable gums. Wax and honey are collected in abundance, as is also cochineal, and the medicinal plants are very numerous. The crops are maize, rice, coffee, cocoa, indigo, mandioc, tobacco, sugar-cane, cotton, sugar, and vegetables. Nearly three-fourths of the land was national property, consisting partly of the lands formerly held by the Jesuit missions, partly of lands never assigned to individuals, partly of lands confiscated in the course of the revolutionary ordeal through which the country had passed; but in the last few years much of it has been sold, generally in large tracts. Under the dictator Francia, 1814–40, agriculture made considerable progress, and the breed of cattle and horses was much improved, and the stock increased. The few manufactures are sugar, rum, cotton and woolen cloths, and leather. The commerce of the country is chiefly in he hands of the government, which holds a monopoly of the export of Paraguay tea. In 1895 the total value of the exports amounted to $12,728,627, and the imports to $2,462,520. The chief exports were textiles, wines and rice; imports, tea, tobacco, hides and skins, and timber, etc. Up till the war of 1865–70, Paraguay had no national debt, but the terrible losses then incurred compelled it in 1871–72, to contract obligations amounting to upwards of $235,000,000. Fifteen millions were contracted in England on the security of the public lands of Paraguay, estimated at upwards of $95,000,000. The foreign debt since that time has been reduced by various arrangements, so that in 1896 it amounted to $4,833,756. The military force, which, during the five years' war, was raised to 60,000 men, has now been reduced to 1345. The established religion is the Roman Catholic, the ecclesiastical head of which is the bishop of Asuncion. Education is very widely diffused; and it is said that there are but few of the people who are not able to read and write.

The history of Paraguay is highly interesting. It was discovered by Sebastian Cabot in 1526, but the first colony was settled in 1535 by Pedro de Mendoza, who founded the city of Asuncion, and established Paraguay as a province of the viceroyalty of Peru. The warlike native tribe of the Guaranis, however, a people who possessed a certain degree of civilization, and professed a dualistic religion, long successfully resisted the Spanish arms, and refused to receive either the religion or the social usages of the invaders. In the latter half of the 16th c. the Jesuit missionaries were sent to the aid of the first preachers of Christianity in Paraguay; but for a long time they were almost entirely unsuccessful, the effect of their preaching being in a great degree marred by the profligate and cruel conduct of the Spanish adventurers, who formed the staple of the early colonial population. In the 17th c. the home government consented to place in their hands the entire administration, civil as well as religious, of the province; which, from its not possessing any of the precious metals, was of little value as a source of revenue; and in order to guard the natives against the evil influences of the bad example

of European Christians, gave to the Jesuits the right to exclude all other Europeans from the colony. From this time forward the progress of civilization as well as of Christianity was rapid. The legislation, the administration, and the social organization of the settlement were shaped according to the model of a primitive Christian community, or rather of many communities under one administration; and the accounts which have been preserved of its condition, appear to present a realization of the ideal of a Christian Utopia. On the expulsion of the Jesuits from Paraguay in 1768, the history of which is involved in much controversy, the province was again made subject to the Spanish viceroys. For a time the fruits of the older civilization maintained themselves; but as the ancient organization fell to the ground, much of the work of so many years was undone; the communities lapsed into disorganization, and by degrees much of the old barbarism returned. In 1776 Paraguay was transferred to the newly-formed viceroyalty of Rio de la Plata; and in 1810 it joined with the other states in declaring its independence of the mother kingdom of Spain, which, owing to its isolated position, it was the earliest of them all to establish completely. In 1814 Dr. Francia (q.v.), originally a lawyer, and the secretary of the first revolutionary junta, was proclaimed dictator for three years; and in 1817 his term of the office was made perpetual. He continued to hold it till his death, in 1840, when anarchy ensued for two years; but, in 1842, a national congress elected two nephews of the dictator, don Alonzo and don Carlos Antonio Lopez, joint consuls of the republic. In 1844 a new constitution was proclaimed, and don Carlos was elected sole president, with dictatorial power, which he exercised till his death in 1862, when he was succeeded by his son, don Francisco Solano Lopez, whose name has become notorious in connection with the tragic struggle of 1865–70, in which the Paraguayans made a heroic but unavailing fight against the combined forces of Brazil, the Argentine confederation, and Uruguay. The war was brought to a close by the defeat and death of Lopez at the battle of Aquidaban, Mar. 1, 1870. In June, 1870, a congress voted a new constitution, which was proclaimed on Nov. 25. It is modeled on that of the Argentine confederation, the legislative authority being vested in a congress of 2 houses, and the executive in a president, elected for 6 years. Paraguay was till 1876 partially occupied by Brazilian troops, and was virtually a Brazilian province.

The central department, in which the capital, Asuncion, is situated, contains nearly one-third of the whole inhabitants; and the capital itself in 1895, (est.) 45,000. Asuncion is connected by railway with Paraguari. The inhabitants of the towns consist chiefly of whites, or half-breeds, speaking Spanish. The native population of the provinces are chiefly Guaranis, speaking the Guarani language.

PARAGUAY TEA. See MÂTÉ.

PARAHI'BA, one of the most eastern maritime provinces of Brazil, bounded on the n. by Rio Grande do Norte, on the s. by Pernambuco, on the w. by Ceara, and on the e. by the Atlantic. Area, 28,854 sq. m.; pop. '90, 382,587. It is traversed by a river of the same name, by a number of smaller streams, and by mountainous ridges, between which are valleys, the soils of which are, for the most part, dry and sandy. Cotton of excellent quality, mandioc, and tobacco are grown; and cotton, sugar, and timber are exported. Capital, Parahiba (q. v.).

PARAHIBA, a town of Brazil, capital of the province, and situated on the river of the same name, about 10 m. from the sea. Besides the cathedral, it contains a number of religious houses, and educational institutions. Pop. 15,000, with district, 40,000.

PARALEPID'IDÆ, a family of fishes, allied to the *salmonidæ* and *scopelidæ*. There are two genera, *paralepis* and *sudis*, the first represented in the Mediterranean, off the shores of Madeira, and Greenland; the latter also in the Mediterranean. The form resembles that of the pike; it is covered with deciduous scales; lateral line straight; teeth on the jaws as well as palate; branchial apertures very large; branchiostegal rays, seven; dorsal fin short and far behind; pectorals well developed; ventrals small, inserted in front of the dorsal.

PARALLAX is the apparent displacement of an object caused by a change of place in the observer. When an object at M is looked at from P, it appears in line with some object, S; but after the observer has moved to E, M has apparently retrograded to a position in line with S'; this apparent retrogression is denominated *parallax*. The angle PME is called the "angle of parallax," or the "parallactic angle," and is the measure of the amount of parallax. To astronomers the determination of the parallax of the heavenly bodies is of the utmost importance, for two reasons—first, from the necessity of referring all observations to the earth's center, i.e., so modifying them as to make it appear as if they had been actually made at the earth's center; and secondly, because parallax is our only means of determining

Fig. 1.

the magnitude and distance of the heavenly bodies. The *geocentric* or *daily* parallax—as the apparent displacement of a heavenly body, due to its being observed from a point on the surface of the earth instead of from its center, is called—is determined as follows: Let P and P′ be two stations on the surface of the earth (fig. 2), E its center, M the object to be observed, and Z and Z′ the zeniths respectively of the observers at P and P′ (points which, if possible, should be on the same meridian exactly); then at P and P′ let the *zenith distances*, ZPM and Z′P′M, be observed simultaneously, and since the latitudes of P and P′, and consequently their difference of latitude, or the angle PEP′, is known, from these three the angle PMP′ (the sum of the parallaxes at P and P′) is at once found; and then, by a trigonometrical process, the separate angles or parallaxes PME and P′ME. When the parallax of M, as observed from P, is known, its distance from E, the center of the earth, can be at once found. When the heavenly body is on the horizon, as at O, its parallax is at a maximum, and is known as the *horizontal* parallax. The geocentric parallax is of use only in determining the distances of those heavenly bodies at which the earth's radius subtends a considerable angle; and as the moon and Mars (when in opposition) are the only such bodies, the parallax of the other celestial bodies must be determined in a different manner. The parallax of the sun (q.v.) is found by observation of the *transit* of Venus across his disk, a much more accurate method than that above described. The parallaxes of the other planets are easily determined from that of Mars.

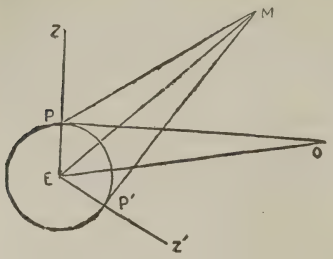


Fig. 2.

In the case of the fixed stars, at which the earth's radius subtends an infinitesimal angle, it becomes necessary to make use of a much larger base-line than the earth's radius, and, as the largest we can employ is the radius of the earth's orbit, it accordingly is made use of, and the displacement of a star, when observed from a point in the earth's orbit instead of from its center, the sun, is called the *annual* or *heliocentric* parallax. Here the base-line instead, as in the former case, of being 4,000 m., is about 92,000,000 m., and the two observations necessary to determine the parallactic angle are made from two points on opposite sides of the earth's orbit, at an interval as nearly as possible of half a year. Yet, notwithstanding the enormous length of the base-line, it bears so small a proportion to the distances of the stars, that only in three or four cases have they been found to exhibit any parallactic motion whatever, and in no case does the angle of parallax amount to 1″ (see Stars). The geocentric horizontal parallax of the moon is about 57′ 4.2″; that of the sun, about 8.6″; and of the double star, 61 *cygni*, the heliocentric parallax has been determined by Bessel to be .348″, equivalent to about 15 millionths of a second of geocentric horizontal parallax. Parallax affects every observation of angular measurement in the heavens, and all observations must be corrected for parallax, or in astronomical phrase, referred to the earth's center before they can be made use of in calculation. The position of a body, when noted from the surface of the earth, is called its *apparent* position; and when referred to the center, its *real* position.

PARALLEL FORCES are those forces which act upon a body in directions parallel to each other. Every body, being an assemblage of separate particles, each of which is acted on by gravity, may thus be considered as impressed upon by a system of parallel forces. The following demonstration will exhibit the mode in which the amount and position of the resultant force are found: Let P and Q be two parallel forces acting at the points A and B respectively, either in the same (fig. 1), or in opposite (fig. 2) directions; join AB, and in this line, at the points A and B, apply the equal and opposite forces S and S, which counterbalance each other, and therefore do not affect the system. Find M and N (see Composition and Resolution of Forces), the resultants of P and S, and Q and S respectively, and produce their directions till they meet in D, at which point let the resultants be resolved parallel to their original directions; then there are two equal forces, S and S, acting parallel to AB, but in opposite directions, and thus, as they counterbalance each other, they may be removed. Then there remain two forces, P and Q, acting at D, in the line DC, parallel to their original directions, and their sum (fig. 1) or difference (fig. 2), represented by R, is accordingly the resultant of the original forces at A and B. To find the position of C, the point in AB, or AB produced, through which the resultant passes, it is necessary to make use of the well-known property denominated the *triangle of forces* (q.v.), according to which the three forces, S, M, and P are proportional to the lengths of AC, AD, DC, the sides of the triangle ADC; then S : P :: AC : CD, similarly Q : S :: DC : CB, therefore Q : P :: AC : BC, and Q ± P or R : P :: AC ± BC or AB : BC, from which proportions we derive the principle of the lever.

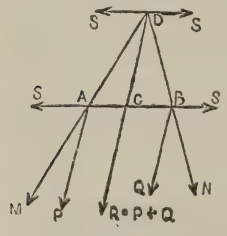


Fig. 1.

$P \times AC = Q \times BC$, and also that $R \times BC = P \times AB$, whence $BC = \frac{P}{R} \times AB$, and the point C is found. The failing case of this proposition is when P and Q acting in opposite parallel directions at different points are equal, in which case the resultant $R = Q - P = Q - Q = O$. In all other cases there is a progressive motion, such as would be caused by the action of a single force $R(=Q \pm P)$ acting at the point C in the direction CR; but in the failing case, since $R = O$, there is no progressive motion, but a rotatory movement round the center of AB. See COUPLE. It is of no consequence whether A and B be the true points of application of the forces P and Q, provided their directions when produced pass through these points, and the point of application of the resultant need not be in the line joining the points of application of the component forces, but its direction must, when produced, pass through C. If there be more than two parallel forces, the resultant of the whole is found by compounding the resultant of the first two with the third in the way given above, thus obtaining a new resultant, which is similarly combined with the fourth force; and so on till the final resultant is found. The center of gravity is only a special name for the point of application of the final resultant of a number of parallel forces.

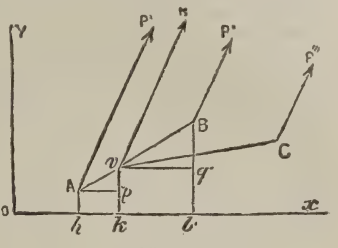


Fig. 2.

PARALLEL'OGRAM, in mathematics, is a quadrilateral rectilineal figure which has its opposite sides parallel; the opposite sides are therefore equal, and so are the opposite angles. If one angle of a parallelogram be a right angle, all its angles are right angles, and the figure is then called a *rectangular parallelogram,* or shortly, a *rectangle;* and if at the same time all the sides are equal, the figure is a *square*; otherwise, it is an *oblong.* If the angles are not right angles, but all the sides are equal, it is called a *rhombus;* and if the opposite sides only are equal, a *rhomboid.* The two lines which connect the opposite corners of a parallelogram are called its *diagonals;* each bisects the parallelogram, and they bisect each other; the sum of their squares also is equal to the sum of the squares of the sides of the parallelogram.

All parallelograms which have equal bases and equal altitudes are equal in area, whether they be similar in shape or not, and the area of a parallelogram is found by multiplying its base by the height.

PARALLELOGRAM OF FORCES. See COMPOSITION OF FORCES.

PARALLELOPI'PED (Gr.), frequently, but improperly written *parallelepiped,* is a solid figure having six faces, the faces being invariably parallelograms, and any two opposite faces equal, similar, and parallel. If the faces are all squares, and consequently equal, the parallelopiped becomes a cube. The volume of a parallelopiped is found by multiplying the area of one face by its distance from the opposite one

PARALLELS, in military language, are trenches cut in the ground before a fortress, roughly parallel to its defenses, for the purpose of giving cover to the besiegers from the guns of the place. The parallels are usually three, with zigzag trenches leading from one to another. The old rule used to be to dig the first at 600 yards distance; but the improvements in artillery have rendered a greater distance necessary; and at Sevastopol, the allies made their first trench 2,000 yards from the walls. The third trench is very near to the besieged works, and from it saps and zigzag approaches are directed to the covertway.—The bearing of parallels in the general conduct of a SIEGE will be found described under that head.

PARALLELS or CIRCLES OF LATITUDE are circles drawn round the surface of the earth parallel to the equator. They may be supposed to be the intersections with the earth's surface of planes which cut the earth at right angles to its axis. The greatest of these circles is the equator, which has the center of the earth for its center, the radius for its radius, and is equally distant at all points from each pole. It is evident that of the others, those next the equator are greater than those more remote, and that they become less and less till at the poles they vanish altogether. The radius of any one circle is evidently equal to the earth's radius multiplied into the cosine of its latitude or distance from the equator. The rotary velocity of the earth's surface, which is about $17\frac{1}{8}$ m. per minute at the equator, is only $8\frac{2}{3}$ m. in lat. 60°; in lat. $82\frac{1}{2}$° (the most northerly point yet reached), is only $2\frac{1}{4}$ m.; and in lat. $89\frac{1}{2}$° (within 35 m. of the pole) is not more than 267 yards per minute.

The most important parallels of latitude are the *tropics of Cancer* (23° 28′ n. lat.) and *Capricorn* (23° 28′ s. lat.), and the *Arctic* (66° 32′ n. lat.) and *Antartic circles* (66° 32′ s. latitude.)

PARALYSIS (Gr., a loosing or relaxing), or PALSY, is a loss, more or less complete, of the power of motion; but by some writers the term is employed to express also loss of sensation. When the upper and lower extremities on both sides, and more or less of the trunk, are involved, the affection is termed *general paralysis.* Very frequently only one-

half of the body laterally is affected, the other side remaining sound; to this condition the term *hemiplegia* is given. When the palsy is confined to all the parts below an imaginary transverse line drawn through the body, or to the two lower extremities, the condition is termed *paraplegia*. When one part of the body, as a limb, one side of the face, etc., is exclusively attacked, the affection is known as *local palsy*. In some cases the loss of sensation and the power of motion in the paralyzed part is entire, while in others it is not so. In the former the paralysis is said to be *complete*, in the latter *partial*. In most cases, but not invariably, sensibility and motion are simultaneously lost or impaired. When motion is lost, but sensation remains unimpaired, the affection has received the name of *akinesia* (Gr. *a*, not, and *kinēsis*, motion). More rarely, there is a loss of sensibility while the power of motion is retained; and to such cases the term *anæsthesia* (Gr. *a*, not, and *aisthesis*, sensation) is applied. This affection occurs most frequently in the organs of sense; as in the tongue, for example, in which the sense of taste may be lost, without any defect of movement.

Paralysis is in most cases a mere symptom of disease existing in some other part than that apparently affected; as, for example, in the brain or spinal cord, or in the conducting nerves between either of these organs and the palsied organ. Sometimes, however, it is a purely local affection, depending upon a morbid condition of the terminal extremities of the nerves. The varieties in the condition of the brain and spinal cord which occasion paralysis are somewhat numerous; as, for example, congestion, hemorrhagic and serous effusion, softening, fatty degeneration, fibrinous exudation, suppuration, hydatids, various morbid growths, depressed bone from external violence, etc. It is highly probable, also, that palsy may sometimes result from mere functional disorder of the nervous centers—a view which is confirmed by the fact that a post-mortem examination of a patient who has suffered from this affection sometimes fails to detect any apparent lesion. Paralysis may originate in a nervous trunk, if it is compressed by a tumor, or otherwise mechanically affected, or if it is the seat of morbid action tending in any way to disorganize it; or it may be due to an abnormal condition of the terminations of the nerves, which may be rendered unfit for receiving impressions either from the external world or from the brain by prolonged disuse, by continuous or severe pressure, by exposure to cold, by disorganization of their own tissue, or by the depressing action of various metallic poisons, especially lead.

We shall briefly notice the symptoms and causes of the most important forms of paralysis, before offering any remarks on the general principles of treatment. *Hemiplegia* (Gr. *hemi*, half, *plēsso*, I strike) affects one *lateral half* of the body, and is that form of palsy to which the term *paralytic stroke* is commonly applied. The parts generally affected are the upper and lower extremities, the muscles of mastication, and the muscles of the tongue on one side. In a well-marked case the patient when seized falls to the ground, all power of motion in the affected arm and leg being lost. The palsy of the face which accompanies hemiplegia is usually quite distinct from the affection known as *facial palsy*, which is an affection of the facial nerve or *portio dura*. See Nervous System. It is the motor branches of the fifth or trifacial nerve going to the muscles of mastication which are generally involved in hemiplegia, and consequently the cheek is flaccid and hangs down, and the angle of the mouth is depressed on the affected side. The tongue when protruded points towards the paralyzed side, and there is often imperfect articulation, in consequence of the lesion commonly affecting the hypoglossal nerve. Hemiplegia may arise from lesions of various kinds, as, for example, (1) from hemorrhage, or some other morbid change in the brain, in which case the palsy is on the side of the body opposite to the lesion, in consequence of the decussation or crossing over of nervous fibers from one side to the other that occurs at the upper part of the spinal cord (q.v.); (2) from spinal disease below the point of decussation just noticed; in this case the palsy, and the lesion causing it, are on the same side of the body. It is also sometimes associated with hysteria, epilepsy, and chorea, but in these cases it usually disappears in a few hours.

Paraplegia (Gr.) is usually confined to the two lower extremities, but the muscles of the lower part of the trunk and of the bladder and rectum are sometimes affected. There are at lest two distinct forms of paraplegia, viz., (1) paraplegia dependent on primary disease of the spinal cord or its membranes, and especially on myelitis (q.v.); and (2) reflex paraplegia, i.e., paraplegia consequent on disease of the kidneys, bladder, urethra, prostate, womb, etc. These two forms of paraplegia differ in many of their phenomena, and the most important of these points of difference have been arranged in a tabular form by Dr. Brown Sequard in his *Lectures on Paralysis of the Lower Extremities*, to which we must refer for the best information on this form of palsy. Paraplegia usually comes on slowly, with a gradual increase of its symptoms. The reflex form is, of course, by far the most favorable, as it usually abates spontaneously on the subsidence of the primary disease.

Facial palsy, although locally affecting only a small part of the body, is a disorder of sufficent importance to require a definite notice. In this affection there is a more or less perfect loss of power over all the muscles supplied by the *portio dura*, or facial nerve. The following graphic account of the appearance of the patient is condensed from Dr. Watson's *Lectures on the Practice of Physic*. From one-half of the countenance all power of expression is gone; the features are blank, still, and unmeaning; the

eyelids apart and motionless. The other half retains its natural cast, except that, in some cases, the angle of the mouth on that side seems drawn a little awry, in consequence of the want of counterpoise from the corresponding muscular fibers of the palsied side. The patient cannot laugh, or weep, or frown, or express any feeling or emotion with one side of his face, while the features of the other may be in full play, nor can he spit or whistle properly. One-half of the aspect, with its unwinking eye, its fixed and solemn stare, might be that of a dead person; the other half is alive and merry. To those who do not comprehend the possible extent of the misfortune, the whimsical appearance of the patient is a matter of mirth and laughter; while, on the other hand, his friends imagine that he has had a stroke, and that he is in a very dangerous state. The nerve may be unable to discharge its duties in consequence of disease within the cavity of the skull, and in that case there is very serious danger; but in the great majority of cases the nervous function is interrupted in that part of the *portio dura* which lies encased in the temporal bone, or in the more exposed part which issues in front of the ear; and hence this form of palsy is generally unattended with any danger to life. It may arise from various causes. Sometimes it is the consequence of mechanical violence, sometimes of tumors pressing on it in the region of the parotid gland, and it very frequently arises from the mere exposure of the side of the face for some time to a stream of cold air.

It yet remains to notice certain kinds of paralysis which differ either in their characters, or in their causes, from those which have been already described—viz., *shaking palsy*, or *paralysis agitans;* and the palsies induced by various poisons. *Shaking palsy* has been defined as "involuntary tremulous motion, with lessened muscular power in parts not in action, and even when supported; with a propensity to bend the trunk forwards, and to pass from a walking to a running pace; the senses and intellect being uninjured." It is chiefly an affection of old age, and often goes no further than to cause an unceasing nodding and wagging of the head in all directions. Somewhat analogous to this form of palsy is that peculiar kind of trembling which is often noticed in persons who are much exposed to the vapor of mercury; *mercurial tremor*, as it is termed by the physicians, and *the trembles*, as the patient usually calls it. It consists in a convulsive agitation of the voluntary muscles, especially when an attempt is made to cause them to act under the influence of the will; a patient with this affection walks with uncertain steps, his limbs trembling and dancing as if they had been hung upon wires. When sitting down he exhibits little or no indication of his disease, but on rising he cannot hold his legs steady, nor direct them with precision; and in severe cases he falls to the ground if not supported. The arms are similarly agitated, and the tongue is usually so tremulous as to render the articulation hurried and unnatural. The disease is especially common in artisans employed in the gilding of metals, and particularly of silver, by means of heat; it is also frequent among the workers of quicksilver mines, in which the crude metal is purified by heat. The time required for the production of the disease varies extremely in different cases (according to Dr. Watson, from two years to five-and-twenty). The duration of the complaint is considerable; it may last two or three months, or longer, but it is seldom fatal.

The palsy arising from the absorption of lead has been already noticed in the article Lead-Poisoning.

A specific form of paralysis of the lower extremities, consequent on the use of flour from the beans of the *lathyrus sativus*, is common in certain parts of India and in Thibet. The ripe bean is an ordinary article of food when made into flour, but it is generally used with wheat or barley flour; it is only when it exceeds one-twelfth part that it is at all injurious, and when it exceeds one-third that the paralysis sets in. Other species of *lathyrus* have been known occasionally to induce similar symptoms in European countries.

We shall enter into no details regarding the treatment of hemiplegia and paraplegia, as the management of these serious affections should be exclusively restricted to the physician. When a patient has an attack of hemiplegia (or a *paralytic stroke*) all that should be done before the physician arrives is to place him in a horizontal position, with the head slightly raised, and to remove any impediments presented by the dress to the free circulation of the blood. Should the physician not arrive in an hour or two, it may be expedient to give the patient a sharp purge (half a scruple of calomel, followed in a few hours by a black draught, if he can swallow; and two drops of croton oil, mixed with a little melted butter, and placed on the back of his tongue, if the power of deglutition is lost), and without waiting for its action, to administer an injection (or clyster) consisting of half an ounce of oil of turpentine suspended (by rubbing it with the yolk of an egg) in half a pint of thin gruel; and cold lotions may be applied to the head, especially if its surface be hot. The question of blood-letting—the universal treatment a quarter of a century ago—must be left solely to the physician. It should, however, be generally known, that if the patient be cold and collapsed; if the heart's action be feeble and intermittent; if there be an anæmic state; if the patient be of advanced age; if there is evidence of extensive disease of the heart or arterial system; or lastly, if there is reason, from the symptons, to believe that a large amount of hemorrhage has already taken place in the brain; these singly, and *a fortiori* conjointly, are reasons why blood should not be abstracted.

Facial palsy, unless the seat of the disease be within the cavity of the cranium, will usually yield in the course of a few weeks to cupping and blistering behind the ear of the affected side, purgatives, and small doses of corrosive sublimate (one-twelfth of a grain three times a day, combined with a little of the compound tincture of bark), which must be stopped as soon as the gums are at all affected. Exposure to cold air must be carefully avoided during treatment.

Little or nothing can be done to cure *paralysis agitans*. In the treatment of *mercurial tremor*, the first step is to remove the patient from the further operation of the poison, while the second is to remove the poison already absorbed into the system, which is effected by the administration of iodide of potassium. This salt combines with the metallic poison in the system, and forms a soluble salt (a double iodide of mercury and potassium), which is eliminated through the kidneys. Good food and tonics (steel or quinia, or the two combined) should be at the same time freely given.

The writer of this article has no personal knowledge of the treatment that should be recommended in the paralysis produced by the use of *lathyrus sativus*, but cases are reported which seem to have been benefited by good diet, tonics, strychnia, and the application of blisters to the loins.

PARAMARIBO, the capital of Dutch Guiana, is situated on the left bank of the river Surinam, about 20 m. from its mouth, in 5° 50′ n. lat., and 55° 10′ w. long. It forms a rectangle of nearly a mile and a half in length by three-quarters in breadth. The streets are broad, covered with shell-sand, and planted on both sides with orange, lemon, tamarind, and other trees. Near the river, the houses, which are chiefly of wood, stand somewhat closely together, but in the remoter parts each is surrounded by its own garden. The rooms are wainscoted with the choicest woods, and elegantly furnished.

In approaching Paramaribo from the sea fort Zeelandia is first reached; then the bureau of finance and court of justice on the government plain, which is surrounded by stately cabbage-palms; the governor's house, with shady double avenue of tamarind trees; and lastly, the business streets stretching along the river side. There are Dutch Reformed, Lutheran, Moravian, and Roman Catholic churches, and two synagogues; a military hospital, and a bank. Fort Zeelandia has a large and beautiful barrack, with several roomy houses for the officers. Paramaribo has a neat, pleasant, and picturesque appearance, the white painted houses, with bright-green doors and windows, peeping out from the shady trees, and the river being thronged with the tent-boats and canoes which are constantly arriving and departing. The Moravians have extensive missions among the bush negroes.

In 1890, the population amounted to 28,831. By royal decree of Feb. 6, 1851, the flogging of slaves in the Netherlands West Indies was forbidden, except through officers appointed for the purpose, and the number of lashes was limited. This check, however, was frequently evaded, and the greatest barbarities practiced, so that the feeling in favor of emancipation increased in the Netherlands, and a bill was passed, Aug. 8, 1862, for emancipating the slaves on July 1, 1863.

Paramaribo enjoys nearly all the trade of the colony. In 1894 the arrivals in Dutch Guiana were 222 ships, of 93,000 tons. In the spring at high tide the harbor will admit ships of from 20 to 21 feet draught, the water having that depth over the bars at the mouth of the river, but during the dry season only smaller vessels have access to it. There are four wharves with a total length of about 720 feet and varying in depth from 23 ft. in high water, to 11 ft. in low water in ordinary spring tides. The harbor is defended by two forts, Zeelandia and New Amsterdam, which stand at the entrance to the river. The imports include many of the necessaries of life together with tobacco and liquors. The exports comprise gold, cacao, sugar, molasses, rum and caoutchouc. French, English and Dutch steamship lines connect with the port.

The natural resources of the surrounding region are important. The coast of Dutch Guiana is an alluvial deposit formed by the rivers and equatorial stream, which flows eastwards. Further inland the soil is diluvial loam, bearing the finest timber trees; and s. of this line are extensive savannas of white sand, stretching towards the hills and mountains of the interior, which are chiefly of gneiss and granite. The average temperature of the year at Paramaribo is 81.7° F.; for Jan. 79.3°, for Aug. 83.7°. The rainfall for a period of twelve years was 107.95 in.

PARAMATTA is a light worsted twilled fabric for female dress. It was invented at Bradford, in England, and has become an important manufacture of that place. The weft consists of combed merino wool, and the warp of cotton. It resembles in texture the Coburg and Orleans cloths.

PARAMATTA, a pleasantly situated t. of New South Wales, stands near the w. extremity of port Jackson, on a small river of the same name, and is 14 m. by land w.n.w. of Sydney, with which it is connected both by steamer and railway. The houses are mostly detached, and the streets are wide and regular, the principal one being about a mile in length. The institutions comprise churches, schools, an orphan and a lunatic asylum, and a prison. There was formerly an observatory here, but it was removed to Sydney in 1858. "Colonial tweeds," "Paramatta cloths," and salt are manufactured. Pop. '91, 11,677.

The town of Paramatta, formerly called Rosehill, is, with the exception of Sydney, the oldest in the colony. The first grain raised in the colony was grown here, and the first grants of land made.

PARAM'ETER, or LATUS RECTUM, a term used in conic sections, denotes, in the case of the parabola, a third proportional to the abscissa of any diameter and its corresponding ordinate; in the ellipse and hyperbola, a third proportional to a diameter and its conjugate. The parameter of any diameter is, in the case of the parabola, the same as the double ordinate of that diameter which passes through the focus, and is four times as long as the distance between the diameter's vertex and the directrix. The term parameter was also at one time used to denote *any* straight line about a curve, upon which its form could be made to depend, or any constant in its equation, the value of which determined the individual curve; but its employment in this sense is now discontinued, except in the theory of homogeneous differential equations, where the constants, for the purpose of aiding the solution, are supposed to vary; and the method is consequently denominated the "variation of the parameters." In the application of this method to determine the orbital motions of the planets, the "seven necessary data" (see ORBIT) were called parameters, but for this the term "elements" is now substituted.

PARAMUSHIS or **PAROMUSHIS**, one of the northern islands of the Kurile group, a little south of Kamchatka.

PARANÁ, an important river of Brazil, rises in the province of Minas Geraes, about 100 m. n.w. of Rio de Janeiro. It flows w. for upwards of 500 m., through the provinces of Minas Geraes and São Paulo. In the latter it is joined by the Parnahiba, after which its course alters, and it flows s.s.w. to Candelaria. Passing this town, it flows w. for 200 m. to its confluence with the Paraguay (q.v.), and then bending southward passes Santa Fé, below which its channel frequently divides and incloses numerous islands. After passing Santa Fé, it rolls onward in a s.e. direction and unites with the Uruguay in forming the Rio de la Plata. Entire length about 2,200 miles. It draws a number of considerable tributaries from the province of Paraná (q.v.); and of the others the chief are the Paraguay, Uruguay, Pardo, Tiete, and Parnahiba. For vessels drawing 16 ft. it is navigable to Rosario, but navigation is difficult on account of shifting sand banks.

PARANÁ, a province in the s. of Brazil, is bounded on the n. by the province of São Paulo; on the e. by the Atlantic; s.e. by Santa Catharina; s. by Rio Grande do Sul; w. by Paraguay and Matto Grosso. Area stated at 85,453 sq. miles. Pop. '90, 626,722. The capital is Curityba, and previously to 1852 this province formed a territory called the Comarca of Curityba, included in the province of São Paulo. It fully commenced its provincial career in 1853. The sea-coast is indented by several bays, but the chief and almost the only port as yet is Paranagua. A line of mountains runs parallel to the coast at a distance of about 80 m. inland, and throws out spurs and branches westward. The streams flowing e. from this water-shed, though numerous, are inconsiderable; while the rivers flowing westward into the Paraná (q.v.), which forms the western boundary of the province, are all about or upwards of 400 m. in length. The principal are the Paranapanema, Ivay, Piquery, aud Yguassu. The climate is unusually healthy; the soil is fertile; and agriculture, rearing cattle and swine, and gathering *mâté*, or Paraguay tea, are the chief employments. The capital, Curityba, has manufactures of coarse woolens, and with its agricultural surroundings has a pop. of 6,000.

PARANAGUA, a seaport in the state of Paraná, Brazil, on the bay of Paranagua, 233 m. s.s.w. of Therezina. Population about 5000.

PARANAHYBA, the name of two rivers in Brazil. The first is one of the head-streams of the Paraná, and for a portion of its course forms the boundary line between the states of Goyaz and Minas Geraes. The second flows into the Atlantic Ocean in lat. 2° 50′ s.

PARANAHYBA, a seaport in the province of Piauhy, Brazil, situated on the second named river in the previous article. Population about 5000.

PARANA-PANEMA, a river in Brazil, takes its rise in São Paulo, and after passing between the states of São Paulo and Paraná enters the Paraná river in about lat. 20° s. Total length about 466 m. Small boats run up to Anhumas, 170 m. from its mouth.

PARAPET (Ital. *para-petto*, from *parare*, to protect, and *petto*, the breast), a wall raised higher than the gutter of a roof for protection; in military works, for defense against missiles from without (see FORTIFICATION); in domestic buildings, churches, etc., to prevent accident by falling from the roof. Parapets are of very ancient date. The Israelites were commanded to build "a battlement" round their flat roofs. In classic architecture balustrades were used as parapets. In Gothic architecture parapets of all kinds are used. In early work they are generally plain, but in later buildings they are pierced and ornamented with tracery, which is frequently of elaborate design, especially in French flamboyant work. Shields and little arcades are also used as ornaments to parapets; and the battlements of castles are imitated in the parapets of religious and domestic buildings. See illus., FORTIFICATION, vol. VI.

PARAPH (Gr. *para*, beside, and *hapto*, to touch), an addition to the signature formed by a flourish of the pen, which, during the middle ages, constituted some sort of provision against forgery. Its use is not altogether extinct in diplomacy, and in Spain the paraph is still a usual part of a signature.

PARAPHERNA LIA (Gr. *para,* beside or beyond; *pherne,* dower) is a term borrowed from the Roman law to denote certain articles of personal adornment and apparel belonging to a married woman. According to the usual rule in the law of England, all the personal property of a woman becomes the property of her husband when the marriage takes place, unless there is a marriage settlement; but there is an exception as regards the trinkets and dress of the wife so far as suitable to her rank in life, and which she continues to use during the marriage. In such a case the property in these articles does not vest absolutely in the husband. He cannot bequeath them by his will to a third person, but if he gave them to the wife, he may pawn, or sell, or give them away, and they can be seized in execution to pay his debts, except so far as they constitute necessary clothing. And if he were to die insolvent, they may, except that part which is necessary clothing, be taken by the husband's creditors. If the paraphernalia were given, not by the husband but by a third party before or during marriage, then they are presumed to be given for the wife's separate use, and the husband or his creditors cannot in any way interfere with them. While it is true that in the U. S. the husband has only a qualified property in the P. of his wife, yet, with the exception of N. Y., and possibly two or three other states, the husband must join with the wife in an action to recover damages for any injury to her P. There must be, however, express proof of gift to the wife to enable the wife to sue alone, even in these exceptional instances.

PARAPHRASE (Gr. *para,* beside, and *phrazein,* to speak) is the name given to a verbal expansion of the meaning either of a whole book, or of a separate passage in it. A paraphrase consequently differs from metaphrase, or strictly literal translation, in this, that it aims to make the sense of the text clearer by a lucid circumlocution, without actually passing into commentary. The versified passages of Scripture, forming part of the psalmody of the Scottish church, are popularly known as "the paraphrases."

PARAPLE'GIA. See PARALYSIS.

PAR'ASANG, a lineal measure still used by the Persians, and often alluded to by the Greeks. The estimate of its length given by Herodotus, Suidas, Hesychius, and Xenophon, and concurred with by modern travelers, is equivalent to about 30 Greek *stadia,* or 3¾ English miles. The word is thought to be derived from seng (Persian, a stone), and para (Sanskrit, end), in allusion to milestones. Byzantine writers reckoned it at 21 *stadia;* Strabo reckoned it at 30, 40, and even 60 *stadia.* Persian authorities are divided.

PARAS'ARA is the name of several celebrated personages of ancient India, met with in the *Mahâbhârata* (q.v.), the *Purân'as* (q.v.), and other works. Of one personage of this name, the *Mahâbhârata* relates that he was the son of S'akti, who was the son of the patriarch Vasisht'ha. King Kalmâshapâda once meeting with S'akti in a narrow path in a thicket, desired him to stand out of the way. The sage refused, on which the râja beat him with his whip, and S'akti cursed him to become a râkshasa, or demon. The râja, in this transformation, killed and ate S'akti, together with the other sons of Vasisht'ha. S'akti, however, had left his wife, Adris'yanti, pregnant, and she gave birth to Parâ'sara, who was brought up by his grandfather. When he grew up, and was informed of his father's death, he instituted a sacrifice for the destruction of all the Râkshasas, but was dissuaded from its completion by Vasisht'ha and other sages. The same legend is referred to by the *Vishn'u-Purâna,* where Parasara is introduced as relating, himself, part of this story, and adding, that the saint Pulastya, one of the mind-born sons of Brahma, in reward of the clemency he had shown even toward such beings as the Râkshasas, bestowed on him the boon of becoming the author of a compendium, or rather the compiler, of the *Purân'as,* and of the *Vishn'u-Purâna* in particular. "This tradition," Prof. Wilson observes (*Vishn'u-Purâna,* ed. Hall, vol. i., p. 10), "is incompatible with the general attribution of all the *Purân'as* to Vyâsa;" but it may perhaps point to a later recension when, to the native mind, Vyâsa would still remain the reputed author of the older *Purân'as,* although, of course, even this assumption has little claim to historical truth. A Parasara, probably different from the one named, is the author of a celebrated code of laws; he is mentioned by Yâjnavalkya in his standard work, and often quoted by the commentaries.—A probably third Parasara is the reputed author of a Tantra (q.v.): and a fourth the author of an astronomical work.—Parâs'aras (in the plural) designates the whole family to which the different Parâs'aras belong.

PARASI'TA, or ANOPLU'RA, an order of insects, to all of which the name louse is popularly given. All live as parasites on quadrupeds and birds. The characters of the order are noticed in the article LOUSE. It remains, however, to be added that the order is divided into two sections: in the first of which, *pediculidea,* the mouth is small and quite suctorial; whilst in the second, *nirmidea,* it is furnished with mandibles and hooked maxillæ. The species of the first section are found only on man and mammals; those of the second section, almost exclusively on birds, although one infests the dog. The *nirmidea* show much greater activity than the *pediculidea.* When a bird dies, the bird-lice congregate near the beak, and seem disquieted, apparently anxious to change their abode.

PARASITE (Gr. from *para*, beside; *sitos*, food; one who eats with another; hence one who eats at the expense of another), a common character in the Greek comedies; a low fellow, who is ready to submit to any indignity, that he may be permitted to partake of a banquet, and who lives as much as possible at the expense of others.

PARASITIC ANIMALS are numerous. Some of them are entozoa, and some are epizoa. See these heads. They belong to different classes, and even to different divisions of the animal kingdom; all, however, are invertebrate. Many are of the division *articulata*, and many of the division *radiata*. Besides *worms* of various kinds, there are among parasites not a few crustaceans, as the lerneans, etc., and not a few insects, as the louse. These insects constitute the order *parasita* or *anoplura*. Some of the cirrhapods which live in the skin of large marine animals, as whales, can scarcely be regarded as parasitic animals, but rather bear to them a relation such as *epiphytes* do to parasitical plants, not deriving their food from the animal on which they live. Tape-worms, ascarides, and other intestinal worms, do not directly draw sustenance from the animal in which they live, by extracting its juices, but they live at its expense, by consuming its food, after the food has undergone, in great part, the process of digestion.

PARASITIC DISEASES constitute one of the recognized orders of disease in Dr. Farr's classification. See Nosology. In these diseases, certain morbid conditions are induced by the presence of animals or vegetables which have found a place of subsistence within some tissue or organ, or upon some surface of the body of man or of other animals. Even plants are not exempt from disorders of this nature (see Parasitic Plants). The forms of animal life giving rise to parasitic diseases are described in articles Ascarides, Cestoid-worms, Entozoa, Epizoa, Guinea-Worm, Itch-Mite, Louse, Nematelmia, Strongylus, Tapeworms, Trichina, etc. With the vegetable structures which give rise to special diseases we are less accurately acquainted, in consequence of the limited knowledge of cryptogamic botany possessed by many writers who have recorded their experience of these cases. These parasites are either *fungi* or *algæ*, and are composed of simple sporules, germs, or cells, or of cells arranged in rows, or groups, which are so minute as to require the microscope for their recognition. Fungi are the most numerous of all plants in regard to genera and species, and their growth is associated with serious injury both to animal and vegetable life. It is not, however, always easy to determine whether they are the direct cause of disease, or whether the diseased tissue has merely afforded a suitable nidus for their development. "It is certain," says Dr. Aitken, who has entered more fully into this subject than any other English writer on the practice of medicine, "that wherever the normal chemical processes of nutrition are impaired, and the incessant changes between solids and fluids slacken, then, if the part can furnish a proper soil, the cryptogamic parasites will appear. The soil they select is, for the most part, composed of epithelium or cuticle, acid mucus or exudation. Acidity, however, though favorable to their growth, is not indispensable, since some of the vegetable parasites grow upon alkaline or neutral ground, as on ulcerations of the trachea, or in fluid in the ventricles of the brain. Certain atmospheric conditions seem favorable to the occurrence of these vegetable parasites. For example, *tinea tonsurans* may be quite absent for years in places such as work-houses, where it commonly exists, and then for several months every second or third child in the place gets the disease."

There is undoubted evidence from the observations and experiments of Devergie, Von Bärensprung, and others, that these parasitic diseases may be transmitted by contagion from horses, oxen, and other animals to man; while conversely, Dr. Fox mentions an instance of a white cat which contracted the *mange* from *tinea tonsurans* (ringworm of the scalp), which affected the children of the family to which it belonged—the fungus of the mange in the cat being the same fungus as that of *tinea* in the human subject, viz., the *tricophyton* (Gr. *tric* (tric), of a hair, and *phyton*, a plant).

The principal vegetable parasites associated in man with special morbid states are arranged by Aitken (*The Science and Practice of Medicine*, 1863, 2d edit., vol. ii., p. 171) as follows: 1. The *trycophyton tonsurans*, which is present in the three varieties of *tinea tondens*—viz., *T. circinatus* (ringworm of the body), *T. tonsurans* (ringworm of the scalp), and *T. sycosis menti* (ringworm of the beard). 2. The *tricophyton sporuloides*, which, together with the above, is present in the disease known as *plica polonica*. 3. The *achorion schönleinii* and *puccinia favi*, which are present in *T. favosa*, known also as *favus* (q.v.), and *porrigo scutulata* (the honeycomb ringworm). 4. The *microsporon mentagrophyta*, which is present in *mentagra*. 5. The *microsporon furfur*, which occurs in *pityriasis versicolor*. 6. The *microsporon audouini*, which is present in *porrigo decalvans*. 7. The *mycetoma* or *chionyphe carteri*, which gives rise to the disease known as the "fungus foot of India," etc. 8. The *oidium albicans* of diphtheria and aphtha. 9. The *cryptococcus cerevisiæ*, or *yeast plant*, occurring in the urine and contents of the stomach, if there is saccharine fermentation. 10. The *sarcina goodserii*, or *merispædia ventriculi* (of Robin), found in vomited matters and in the urine. There are strong grounds, based partly on botanical and partly on clinical observation, for believing that the various fungi already described are mere varieties of two or more species in various phases of development.

We shall conclude this article with a brief notice of the most dangerous of all the parasitic diseases—the *fungus foot* or *fungous disease of India*. It occurs in many parts of India, and the n.e. shores of the Persian gulf. It is a disease which occurs among natives only, so far as has been yet observed, and is undoubtedly due to the presence of a fungus which eats its way into the bones of the foot and the lower ends of the tibia and fibula, penetrating by numerous fistulous canals through the tissue of the entire foot, and tending to cause death by exhaustion, unless amputation is performed in due time. Dr. Carter has described three forms of this disease, in which both the symptoms and the fungoid material differ considerably from each other. A few remarks on the first of these forms will suffice as an illustration of parasitic disease. In this form the bones of the foot and the lower ends of the leg-bones are perforated in every direction with roundish cavities, varying in size from that of a pea to that of a pistol-bullet, the cavities being filled with the fungoid matter. The surrounding muscles, and subsequently the tendinous and fatty structures, are converted into a gelatiniform mass, in consequence of which the foot presents a peculiar turgid appearance. Examined under the microscope, the fungoid mass is found to consist of short, beaded, tawny threads or filaments, arising from a common center, and having at their tips large spore-like cells. For further information regarding this remarkable form of disease, the reader is referred to Dr. Carter's paper in the fifth volume (new series) of the *Transactions of the Medical and Physical Society of Bombay*, and to the Rev. M. J. Berkeley's account of his examination of the fungus, in the second volume of *The Intellectual Observer*, p. 248.

Further notice of the parasitic diseases of the skin will be found in the articles PITYRIASIS (var. *versicolor*), RINGWORM, SCALD-HEAD, etc.

PARASITIC PLANTS are plants which grow on other plants, and derive subsistence from their juices; the plants which live parasitically on animal tissues being generally called entophytes (q v.), although the distinction between these terms is not always preserved. Epiphytes (q.v.) differ from parasitical plants in not subsisting on the juices of the plant which supports them but merely on decayed portions of its bark, etc., or drawing all their nourishment from the air. Parasitical plants are numerous and very various; the greater number, however, and the most important, being small fungi, as rust, brand, bunt, smut, etc., the minute spores of which are supposed, in some cases, to circulate through the juices of the plants which they attack. Concerning some minute fungi, as the mildews, it is doubted if they are truly parasitical, or if their attacks are not always preceded by some measure of decay. But among parasitic plants are not a few phanerogamous plants, some of which have green leaves; and some are even shrubby, as the mistletoe, loranthus, etc.; whilst the greater number have brown scales instead of leaves; as dodder, broom-rape, lathræa, etc., and the whole of that remarkable order or class of plants called *rhizantheæ* or *rhizogens*, of which the genus *rafflesia* is distinguished above all other plants for the magnitude of its flowers. Some parasitic plants, as the species of dodder, begin their existence by independent growth from the ground; but when they have found suitable plants to take hold of and prey on, the connection with the ground ceases. Not a few, as broom-rape and lathræa, are root-parasites, generally attaching themselves to the roots of trees or shrubs; whilst some, as the eyebright (*euphrasia officinalis*), yellow rattle (*rhinanthus crista galli*), cow-wheat (*melampyrum arvense*), etc., are parasitical only occasionally and partially, and are chiefly found on neglected grass lands. Root-parasites generally attach themselves by means of little tubercles, which bury themselves under the bark.

PARATOLOID. See KOCH, ROBERT; TUBERCULINE.

PARATY', a sea-port t. of Brazil, in the province of Rio de Janeiro, on the w. coast of the bay of Angra, 105 m. w.s.w. of Rio de Janeiro city. It has extensive commerce, and numerous distilleries.

PARAY-LE-MONIAL, a t. of France, department of Saône-et-Loire, celebrated for its Benedictine abbey, founded in 973, which contains the tomb of Mary Margaret Alocque, the center of recent pilgrimages by the confraternities of the Sacred Heart (q.v.).

PARBUCKLE is a mode of drawing up or lowering down an inclined plane any cylindrical object, as a barrel or a heavy gun, without the aid of a crane or tackle. It consists in passing a stout rope round a post or some suitable object at the top of the incline, and then doubling the ends under and over the object to be moved. This converts the cask or gun into a pulley in its own behalf, and limits the pressure at each end of the rope to one-fourth the weight of the object moved, as felt on the incline. By hauling in the ends equally, the cask ascends, or *vice versâ*.

PAR'CÆ (from the root *pars*, a part), the name given by the Romans to the goddesses of fate or destiny, who assigned to every one his "part" or lot. The Greek name, *moiræ*, has the same meaning (from *meros*, a share). They are only once mentioned by Homer, who in every other instance—speak of Fate (Moira) in the singular, and whose Fate was not a deity but a mere personification, the destinies of men being made by him to depend upon the will of the gods; whilst, according to the later Greeks and the Romans, the gods themselves were subject to the control of the parcæ or moiræ. Hesiod, however, who is almost contemporary with Homer, speaks of three fates, whom he calls daughters of Night—Clotho, the spinner of the thread of life; Lachesis, who determines the lot of

life; and Atropos, the inevitable. They were usually represented as young women of serious aspect; Clotho with a spindle, Lachesis pointing with a staff to the horoscope of man on a globe, and Atropos with a pair of scales, or sun-dial, or an instrument to cut the thread of life. In the oldest representations of them, however, they appear as matrons, with staffs or scepters. They had places consecrated to them throughout all Greece, at Corinth, Sparta, Thebes, Olympia, etc.

PARCELS, in the law of England, is the technical word for the article in a conveyance describing the lands, etc., conveyed.

PAR'CENER. See COPARCENARY.

PARCHIM, a t. of the grand-duchy of Mecklenburg-Schwerin, Germany, stands on the Elde, which is here divided into two arms, 20 m. s.e. of Schwerin. It is very old, is irregularly built, surrounded by beautiful gardens, and has a gymnasium and two churches. Pop. '90, 9960, employed in agriculture, in the manufacture of tobacco, cloth, leather, and brandy, and in weaving. Birthplace of Count von Moltke.

PARCHMENT, one of the oldest inventions of writing materials, was known at least as early as 500 years B.C. Herodotus speaks of books written upon skins in his time. Pliny, without good grounds, places the invention as late as 196 B.C., stating that it was made at Pergamus (hence the name *Pergamena,* corrupted into Eng. parchment) in the reign of Eumenius II. in consequence of Ptolemy of Egypt having prohibited the exportation of papyrus. Possibly the Pergamian invention was an improvement in the preparation of skins, which had certainly been used centuries before. The manufacture rose to great importance in Rome about a century B.C., and soon became the chief material for writing on; and its use spread all over Europe, and retained its pre-eminence until the invention of paper from rags, which from its great durability proved a fortunate circumstance for literature.

There are several kinds of parchment, prepared from the skins of different animals, according to their intended uses. The ordinary writing parchment is made from those of the sheep and of the she-goat; the finer kind, known as *vellum,* is made from those of very young calves, kids, and lambs; the thick common kinds, for drums, tamborines, battledores, etc., from those of old he-goats and she-goats, and in northern Europe from wolves; and a peculiar kind is made from asses' skins, the surface of which is enameled. It is used for tablets, as black-lead writing can be readily removed from it by moisture. The method of making parchment is at first the same as in dressing skins for leather. The skins are limed in the lime-pit until the hair is easily removed. They are then stretched tightly and equally, and the flesh side is dressed as in currying, until a perfectly smooth surface is obtained. It is next *ground* by rubbing over it a flat piece of pumice-stone, previously dressing the flesh side only with powdered chalk, and slaked lime sprinkled over it. It is next allowed to dry, still tightly stretched on the frame. The drying process is an important one and must be rather slowly carried on, for which purpose it must be in the shade. Sometimes these operations have to be repeated several times, in order to insure an excellent quality, and much depends upon the skill with which the pumice-stone is used, and also upon the fineness of the pumice itself. When quite dried the lime and chalk are removed by rubbing with a soft lambskin with the wool on.

PARCHMENT, VEGETABLE. This remarkable substance was made known by Mr. W. E. Gaine in 1854, and again by the Rev. J. Barlow in 1857. It resembles animal parchment so closely that it is not easy to distinguish the difference. It is made from the water-leaf, or unsized paper, by immersing it only for a few seconds in a bath of oil of vitriol, diluted with one-half its volume of water. The exactness of this dilution is of the greatest importance to the success of the results. The dilute acid must not be used immediately after mixing, but must be suffered to cool to the ordinary temperature; without attention to these apparently trifling points, the operator will not succeed.

The alteration which takes place in the paper is of a very remarkable kind. No chemical change is effected, nor is the weight increased; but it appears that a molecular change takes place, and the material is placed in a transition state between the cellulose of woody fiber and dextrine. Vegetable parchment is in some respects preferable to the old kind, for insects attack it less, and it can be made so thin as to be used for tracing-paper, and bears wet without injury. Messrs. de la Rue have the credit of giving practical effect to the invention.

PARDESSUS, JEAN MARIE, 1772–1853; b. France; educated to the law, and early distinguished by his facility of expression. He was made associate judge in his native city at 30, and a few years later a member of the French legislative assembly. His *Traité des Servitudes,* published in 1806, established his reputation as a student of equity in law, and a writer of clearness of diction. It quickly reached 8 editions. In 1809 he published *Traité du Contrat et des Lettres de Change,* subsequently published under the title of *Cours de Droit Commercial,* which was considered the masterpiece of its time. A professorship of commercial law was created for him in the law department of the college of France, where his lectures were notable for their brilliancy and the simplicity with which he urged equity as the end of law. Thoroughly royalist in his sympathies.

and yet thoroughly progressive, he occupied a peculiar position in the chamber of deputies under Louis XVIII., being "a republican among royalists and a royalist among republicans." His fame rests on his works upon the history and practice of law.

PARDOE, JULIA, 1806–62; b. Yorkshire, England; daughter of Maj. Thomas Pardoe of the Royal Wagon Train, wrote verses at 13 years of age, a romance at 15, visited Portugal, and in 1833 published *Traits and Traditions of Portugal*, 2 vols.; went to Constantinople in 1835; and in 1836 published *The City of the Sultan*, 3 vols. In 1839 she brought out *The Romance of the Harem*, 3 vols. She traveled in Hungary, and in 1840 *The City of the Magyar* appeared; in 1855 *Reginald Lyle*, and *The Jealous Wife*. She was the author of several meritorious historical works; among them *Episodes of French History during the Consulate and the Empire*, 2 vols, 1859; the same year she received a civil list pension of £100 from the British crown.

PARDON, in law, an act of grace emanating from that power in the state intrusted with the execution of the laws, and exempting the individual on whom it is bestowed from the punishment to which he has been legally sentenced after conviction of crime, or to which he is by law liable for an offense on which he has not been tried and convicted. This is substantially the definition given by Marshall (7 Pet. 160); and it is to be observed that the act is one of clemency not of justice, that it presupposes guilt, and that conviction need not precede the granting of the pardon. But though theoretically the pardon is an act of grace only, practically, in its more judicious use, it is a means of repairing wrong or hardship committed under, and irremediable by, the ordinary legal procedure. The pardoning power is an executive one, belongs primarily to the people, and is usually intrusted to the executive head of the state by constitutional provision. In England the pardon may be granted either by the crown through the home secretary or by act of parliament. The U. S. constitution gives to the president power "to grant reprieves and pardons for offenses against the United States, except in case of impeachment," (art. II., sec. 2). This power is held to extend to the remission of fines and penalties, and cannot be interfered with by legislation of congress. The same rule as to legislation applies in those states where the pardoning power has been conferred absolutely on the governor by state constitution; no limitation is possible except by amendment. In many of the states, however, the constitution provides that the power shall be exercised by the governor and legislature jointly, or by a board of pardons either alone or in conjunction with the executive. The pardon must be accepted or else is of no effect. The bestowal of the pardon carries with it the removal of such disabilities as incapacity to hold office or to vote, but does not restore the recipient to an office forfeited, or invalidate vested rights acquired by a third party in consequence of his conviction. Where property was confiscated by the United States in the war of the rebellion, as having been used for insurrectionary purposes, and the owner subsequently received the president's pardon, it was held that the owner was thereby exempted from the forfeiture in so far as the rights accruing to the government were concerned. The exercise of the pardoning power is purely discretionary, and, though principles may be laid down as to its proper use, the executive cannot be held responsible for its abuse. The pardon may be absolute, or may be coupled with a condition precedent, as the taking of an oath of allegiance. In the latter case proof of performance of the prescribed condition must be presented by the claimant. A general pardon includes all offenders of the same class, and may be implied, as where a penal statute is repealed. Where the pardon is general it is not necessary to set it forth in the pleadings in a subsequent action, but if it be special, *profert* must be made, and the grant produced in court and properly verified. For a discussion of the subject see the works on criminal law of Russell, Wharton, Chitty, and Starkie.

PARDUBITZ, a t. of Austria, in Bohemia, 59 m. e. of Prague. It has sugar, spirit, and chocolate manufactures, and iron foundries. Pardubitz was the headquarters of the king of Prussia, June 7, 1866. Pop. '90 (comm.), 12,367.

PARÉ, AMBROISE, a renowned French surgeon, and the father of modern surgery, was b. about the beginning of the 16th c., at Laval, department of Mayenne, France. His father, who was a trunk-maker, was unable to afford him a literary education, and apprenticed him to a barber and surgeon. Paré, after a brief term of service, acquired such a fondness for surgery and anatomy, that, abandoning his master, he went to Paris to prosecute his studies. His means for doing so were very limited; he could afford to obtain instruction from only the more obscure teachers; few books were within his reach, yet by dint of perseverance and the exercise of a rare discrimination, combined with the valuable practice in the Hôtel de Dieu of Paris, he laid a solid foundation for future eminence. In 1536 Paré was received as a master barber-surgeon, and joined in this capacity the army of Marshal René de Monte-Jean, which was on the point of starting for Italy. During this campaign he improved the mode of treatment of gunshot wounds, which had up to this time been of this most barbarous kind—namely, cauterization with boiling oil. His reputation as well as his skill were greatly heightened during this campaign, and as he himself says: "If four persons were seriously wounded I had always to attend three of them; and if it were a case of broken arm or leg, fractured skull, or fracture with dislocation, I was invariably summoned." In 1539 he returned to Paris, whither his high renown had preceded him, and was received with

distinction by the royal college of surgery, of which he was subsequently appointed president. On the war being renewed, he was again attached to the army, under the vicomte de Rohan, afterwards under Antoine de Bourbon, duke of Vendôme. It was during this campaign that he cured François, the second duke of Guise, of the wound which conferred upon him the sobriquet of *Balafré*, and that he substituted ligature of the arteries for cauterization with a red-hot iron after amputation. The idea of this mode of repressing hemorrhage had long been in existence, but he was the first to show that it could safely be applied to practice. Many other important improvements in surgery were introduced by him at this time. In Sept., 1552, he was appointed surgeon to King Henry II., and in the following year was taken prisoner at Hesden ; he was, however, released, in consideration of his having cured Col. de Vaudeville, after rejecting the brilliant offers made him by the duke of Savoy to remain in his service. Returning to Paris, honors were showered upon him; and though he was ignorant of Latin, the *conditio sine quâ non* of a liberal education at that time, no hesitation was shown in conferring upon him learned titles and degrees. He attended Francis II. on his death-bed, and continued to hold the office of king's surgeon to his successors, Charles IX. and Henry III. The former of these monarchs, whose life had been gravely threatened by an injury inflicted by his physician Portail, and who had been preserved by Paré, testified for him the greatest esteem, and saved him during the massacre of St. Bartholomew by locking him up in his own chamber. During the latter part of Paré's life he was much employed in the publication of his various writings, and suffered considerable annoyance from the envious spirit displayed towards him by his professional brethren, who showered obloquy upon him for having, as they said, "dishonored science by writing in the vulgar tongue." Paré died at Paris, Dec. 22, 1590. His writings have exercised a great influence on the practice of surgery in all countries to which they have penetrated, and are held of the highest authority on the subject of gun-shot wounds. The first complete edition of them appeared at Lyons in 1562, and the last, edited by M. Malgaigne, at Paris (1840–41, 3 vols.). Besides these are 8 Latin editions, and more than 15 translations into English, Dutch, German, etc. As an instance of his great popularity in the army, it may be mentioned that the soldiers of the garrison of Metz, of their own accord, gave him a triumphal reception on his entering that town.

PAREGOR'IC, or PAREGORIC ELIXIR (from the Gr. *parēgoricos*, soothing), the *compound tincture of camphor* of the London, and the *camphorated tincture of opium* of the American pharmacopœia, consists of an alcoholic solution of opium, benzoic acid, camphor, and oil of anise, every fluid ounce containing two grains each of opium and benzoic acid, and a grain and a half of camphor. This preparation is much used both by the profession and the public. In doses of from one to three drams, it is an excellent remedy for the chronic winter-cough of old people, the opium diminishing the bronchial secretion and the sensibility of the pulmonary mucous membrane, while the benzoic acid and oil of anise act as stimulating expectorants. It has also been found useful in chronic rheumatism.

PAREIRA BRAVA is the root of the *chondodendron tomentosum*. It had for a century been supposed that the root known as *pareira brava* was that of *cissampelos parevia*, but its true origin was established by Hanbury in 1873. *Chondodendron tomentosum* is a tall, woody, climbing plant, a native of Brazil and Peru, belonging to the order *menispermaceæ*. It has large ovate-cordate, fine-nerved leaves, very small unisexual flowers, and purplish-black, ovoid one-seeded drupaceous fruits, resembling grapes. As it comes to market the root is in pieces from three to six inches long, or more, and from one to three inches in diameter, of a dark-brown color externally with transverse ridges and fissures, and irregular longitudinal furrows. When cut it presents a palish brown color and a waxy luster, and when broken, a fibrous fracture. It is nearly inodorous and has a bitter taste. The stem is sometimes found mixed with the root, which it much resembles, but may be distinguished by the pith. Several roots of menispermous plants have been sold for *pareira brava*, and recently a *yellow pareira brava* has been imported from Brazil. It comes in the form of flat, twisted stems which have been thought to be obtained from *abuta amura*. It may be detected by the eccentric arrangement of its woody zones, which in the genuine are symmetrically concentric. Pareira brava contains a yellow, bitter principle, which has been called *cissampelina* (after the plant for which it has been mistaken), soluble in alcohol and ether; a soft resin soluble in alcohol; and a brown extract soluble in alcohol and water. It appears to have therapeutic properties similar to those of *uva ursi*. It has been used with benefit in chronic pyelitis and cystitis in the form of an infusion, decoction, or fluid-extract. The solid extract is said to be less active. See CISSAMPELOS.

PAREJA, JUAN DE, 1606–70 ; b. West Indies ; son of a Spanish father and an Indian mother. He was at first a slave of the painter Velasquez, for whom he ground colors. He passed his nights in drawing, copying the manner of his master. He had noticed that Philip IV., who was in the habit of visiting the studio of Velasquez, always directed any painting which was placed with its face to the wall to be turned. Pareja

put one of his own pictures in that position, and the king, as he expected, ordered it to be turned, and admired it. Velasquez disowned it, and Pareja confessed that it was his, and was immediately emancipated at the instance of the king. He did not, however, leave Velasquez, but remained in his house in the double capacity of a servant and a pupil. After the death of Velasquez he continued to serve his master's daughter, with whom he remained till her death. He was particularly successful in portrait painting, and his works in coloring and treatment closely resemble those of his master. His best picture is "The Calling of St. Matthew," in the Spanish royal gallery.

PAREL'LA (Fr. *parelle* or *perelle*), a name often given to some of those crustaceous lichens which are used to produce archil, cudbear, and litmus; but which more strictly belongs to one species *Lecanora parella*, resembling the cudbear lichen, but with somewhat plaited warty crust, and shields (*apothecia*) having a concave disk of the same color as the thick tumid even border. Like the cudbear lichen—to which it is far superior in the quality of the dye-stuff obtained from it—it grows on rocks in mountainous districts both in Britain and on the continent of Europe, being particularly abundant in Auvergne and other parts of France.

PAREN'CHYMA. See CELLULAR TISSUE.

PARENT AND CHILD. The legal relation between parent and child is one of the incidents or consequences of the relation of husband and wife, and flows out of the contract of marriage. The legal is to be distinguished from the natural relation, for two persons may be by the law of nature parent and child, while they are not legally or legitimately so. Hence a radical distinction exists between natural, or illegitimate, and legitimate children, and their legal rights as against their parents respectively are very different. Legitimate children are the children of two parents who are recognized as married according to the laws of the country in which they are domiciled at the time of the birth; and according to the law of England, if a child is illegitimate at the time of the birth, nothing that can happen afterwards will ever make it legitimate, the maxim being "once illegitimate always illegitimate"—a maxim which, as will be stated, has some exceptions in Scotland. In treating of the laws affecting the mutual relation of parent and child, the laws of England and Ireland, which differ from the law of Scotland in material respects, will first be stated.

1. *As to Legitimate Children.*—These laws relate first to the liability of the parent to maintain the child, and the rights of the child in the event of the parent's death. As regards the maintenance of the child, it is somewhat singular that, according to the law of England, there is no duty whatever on the parent to support the child, and consequently no mode of enforcing such maintenance. The law of nature was probably considered sufficient to supply the motives which urge a parent to support the child, but the municipal law of England has not made this duty compulsory. This defect was to some extent remedied when what is called the poor-law was created by statute in the reign of Elizabeth by which law parents and children are compellable to a certain small extent, but only when having the pecuniary means to do so, to support each other, or rather to help the parish authorities to do so. But apart from the poor-law statutes, there is no legal obligation on the parent to support the child, nor on the child to support the parent. Hence it follows, that if the child is found in a destitute state, and is taken up, fed, clothed, and saved from starvation by a stranger, such stranger cannot sue the parent for the expense, or any part of it, however necessary to the child's existence. In order to make the father liable for maintenance, there must in all cases be made out against him some contract, express or implied, by which he undertook to pay for such expense; in other words, the mere relationship between the parent and child is not of itself a ground of liability. But when the child is living in the father's house, it is always held by a jury or court that slight evidence is sufficient of, at least, an implied promise by the father to pay for such expenses. As, for example, if the child orders clothes or provisions, and the father see these in use or in process of consumption, it will be taken that he assented to and adopted the contract, and so will be bound to pay for them. So if a parent put a child to a boarding-school, very slight evidence of a contract will be held sufficient to fix him with liability. Nevertheless, in strictness of law, it is as necessary to prove a contract or agreement on the part of the parent to pay for these expenses as it is to fix him with liability in respect of any other matter. When it is said that a parent is not compellable by the common law to maintain his child, it must, at the same time, be observed that if a child is put under the care and dominion of an adult person, and the latter willfully neglect or refuse to feed or maintain such child, whereby the child dies or is injured, such adult will incur the penalties of misdemeanor; but this offense does not result from the relationship of parent and child, and may arise between an adult and child in any circumstances, as where a child is an apprentice or servant. The change as to the liability of parents to maintain their children created by the poor-laws amounts merely to this, that if a person is chargeable to the parish, that is, not able to work as well as destitute, and if the overseers or guardians are bound to support him or her, then the parish authorities may reimburse themselves this outlay, or part of it, by obtaining from justices of the peace an order commanding the parent or child of such pauper to pay a certain sum per week towards the relief. This is, however, only competent when the relative is able to pay such sum, and in all cases the sum is of necessity

very small. Not only parents, but grand-parents, are liable under the poor-law act to the extent mentioned. Another provision in the poor-law and other kindred acts is, that if a parent runs away and deserts his children, leaving them destitute and a burden on the parish, the overseers are entitled to seize and sell his goods, if any, for the benefit and maintenance of such children; and if the parent, so deserting the children, is able by work or other means to support them, such parent may be committed to prison as a rogue and vagabond. Not only, therefore, is a parent during life not bound to maintain his or her child (with the above exceptions), but also after the parent's death the executors or other representatives of the parent, though in possession of funds, are not bound. It is true that if the parent die intestate, both the real and personal property will go to the children; but the parent is entitled, if he choose, to disinherit the children, and give away all his property to strangers, provided he execute his will in due form, which he may competently do on death-bed if in possession of his faculties.

Another important point of law, affecting the mutual relation of parent and child, is the right of the parent to the custody of the child. At common law it is the father who has the right to the custody of the child until majority at least, as against third parties, and no court will deprive him of such custody except on strong grounds. Whenever the child is entitled to property, the court of chancery so far controls his parental right, that if the father is shown to act with cruelty, or to be guilty of immorality, a guardian will be appointed. A court of common law also has often to decide in cases of children brought before it by *habeas corpus*, when parties have had the custody against the father's will. In such cases, if the child is under fourteen, called the age of nurture, and the father is not shown to be cruel or immoral, the court will order the child to be delivered up to him; but if the child is above fourteen, or, as some say, above sixteen, the court will allow the child to choose where to go. So the father is entitled by his will to appoint a guardian to his children while they are under age. The mother had at common law no right as against the father to the custody of the children, however young; but under a statute of 36 and 37 Vict. c. 12, she is entitled to the custody of the child while under sixteen years of age, or rather she is entitled to apply to the court of chancery for leave to keep the children while under that age, provided she is unobjectionable in point of character; and access may be allowed to the father or guardian. If the parents separate by agreement, no stipulation will be enforced which is prejudicial to the child. In case of divorce or judicial separation, the court of divorce has power to direct who is to have the custody of the children.

2. *Illegitimate Children.*—It has been already stated that, at common law, the parent of a legitimate child is not bound to maintain it, and this is equally true of an illegitimate child—i.e., a child not born in wedlock. In strictness of law an illegitimate child has no father, which means practically that in case of the death of the father without making a will, the law will not treat such child as entitled to the ordinary legal rights of a legitimate child—i. e., to a share of the father's property. The child is not legally related to the father in this sense. With regard to the mother, she also is not bound to maintain her child according to the common law; but the poor-law acts have made an important qualification of her rights and duties. As between the father and mother of the child, the law is this: The father is not bound even by the poor-laws to maintain the child, and the parish officers cannot now institute any proceeding whatever against him for this purpose; but the mother can, to a certain extent, enforce against him a contribution toward the child's maintenance and education, or the guardians may do so. It is entirely discretionary on the mother to take any proceeding against the father, but if she chooses she can do so; and the first step is to go before a justice of the peace, and obtain a summons of affiliation. The father is thus cited before the magistrate, and if the mother swears that he is the father of the child, and is corroborated in some material part of this statement by a third party, the magistrate may make an order against the father to pay the expenses of lying-in, and a weekly sum not exceeding five shillings till the child attains the age of sixteen. The mother may make this application either a few months before the birth, or within twelve months after the birth; and even after that time, provided she can prove that the putative father paid her some money on account of the child within such twelve months. The putative father, in these cases, is a competent and compellable witness. The utmost, therefore, that the father can be made to contribute toward the child's maintenance is only a portion of the whole, the chief burden being thrown on the mother, who is assumed to be the more blamable party. Though she is not bound by the common law to maintain her child, yet the poor-laws make her liable to maintain the child till it attains sixteen; and not only is she bound, but any man who marries her is also by statute bound to support all her illegitimate (and also legitimate) children till they attain sixteen. The result is, that illegitimate children under sixteen are better provided for by the present state of the law than legitimate children, inasmuch as the mother is positively bound to support her illegitimate child, and only to a less extent her legitimate child. As regards the custody of illegitimate children, the mother is the party exclusively entitled, for the father is not deemed, in point of law, to be related to such child. Yet if the father has, in point of fact, obtained the custody of such child, and the child is taken away by fraud, the courts will restore the child to his custody, so as to put him in the same position as before. Though illegitimate children will not succeed to the father's property in the event of his dying with-

out a will, there is nothing to prevent him making his will in their favor, provided he expressly name and identify them, and not leave it to them by the description of "his children," which in point of law they are not.

Scotland.—The law of parent and child in Scotland differs materially from the law of England and Ireland. In Scotland a child may be born a bastard, and yet if the parents afterward marry this will legitimize the child, and give the child the right to succeed to the father's property. A difficulty sometimes arises where, before the father and mother of a bastard marry, the father has had a legitimate family by another woman, in which case it is held that the bastard, though oldest in point of age, does not take precedence of the legitimate children. The law of Scotland also differs from that of England as regards the obligation of parent and child to maintain each other. There is a legal obligation on both parties to maintain each other if able to do so, and either may sue the other for aliment at common law; but this obligation extends only to what may be called subsistence money, and does not vary according to the rank of the party. Thus an earl is bound to pay no more for the aliment of his son than any other father. As regards all maintenance beyond mere subsistence, the law does not materially differ from that of England, and a contract must be proved against the father before he can be held liable to pay. The legal liability as between parent and child is qualified in this way by the common law, that if a person has both a father and a child living and able to support him, then the child is primarily liable, and next the grandchild, after whom comes the father, and next the grandfather. Not only are parent and child liable to support each other while the party supporting is alive, but if he die, his executors are also liable; and this liability is not limited by the age of majority, but continues during the life of the party supported. Such being the common law of Scotland, it was scarcely necessary, as in England, for the poor-law to supply any defect; but the Scotch poor-law supplements the common law, by imposing a penalty on a father or mother (though not *vice versâ*) who neglects to support a child. Another advantage which a Scotch child has over an English child is, that the father cannot disinherit it—at least so far as concerns his movable property; and even in case of heritable property, the rights of the child were so protected, that unless the father made away with his heritable property sixty days before his death, or while in sound health, it was too late to prejudice his heir-at-law; this rule was, however, abolished in 1870 by 34 and 35 Vict. c. 81. This was called the law of death-bed (q.v.); but as regards the father's movable property, he cannot by any will he can make at any time of his life deprive the children of one-third, or, if their mother is dead, of one-half of such property. This is called the children's right to legitim (q.v.), a right which they can vindicate, whatever may be their age when the father dies. With regard to the custody of children in Scotland, the rule is, that the father is entitled to the custody as between him and the mother; but the court of session has power to regulate the custody in case the children are entitled to property, and the father is of an immoral or cruel character; and the court will also interfere to allow to the mother access to the children at certain times and seasons. Another important difference between a Scotch and English child is this, that whereas in England the father or guardian, or the court of chancery, has power to control the custody of the person of the child to a certain extent, until the child attains the age of 21, in Scotland such power entirely ceases when the child attains the age of 14 or 12, according as such child is male or female. At the age of 14, a boy, and at 12, a girl, in Scotland, is entire master or mistress of his or her movements, and can live where he or she pleases, regardless of any parent or court. They can marry at that age at their own uncontrolled discretion, and act in all respects with the same freedom as adults. As regards the disposition of their property there are some restrictions, but as regards the disposal of their persons there are none, after the ages of 14 and 12 respectively.

2. *Illegitimate Children.*—The law of Scotland as to illegitimate children also differs in some respects from that of England. Both the father and mother of a bastard are bound by law to support such child, and the obligation transmits to the personal representatives of the father or mother. Moreover, by the poor-law statute both are liable to a penalty for neglecting to support the child. The mother of illegitimate children is entitled to their custody till the age of ten, if daughters, and if sons, till the age of seven; but the limit is not clearly defined. If the father support the child after the above age, he is entitled to the custody. The mother does not apply to a magistrate for a summons of affiliation in order to fix the paternity; but she may bring an action of filiation and aliment, in which the question of paternity is settled. The father may be judicially examined, and is a competent witness; and it is usual for the court to decree an aliment, varying from £4 per annum against laborers, up to £10 against persons in better circumstances. In Scotland, as in England, the father of a bastard child is not deemed related, in point of law, to such child; and if he desires to provide for such child, it must be done by deed or will, in which the child is identified, and not merely described under the general designation of "child," which he is not.

In the laws and decisions of the United States it is generally held that the rights of protection and support due from a parent to a child are dependent not upon statutory provisions (though these exist in most states), but on general principles of the

common law, as well as of morality. As the protector of his child, a parent may lawfully do any act which he might do in self-defense, and hence may even take the life of an assailant. It has been said that though protection and education are the child's right, yet maintenance and support is the only obligation which can be enforced by the law; if a father fail to supply such necessaries for the support of his minor child as are suitable to its rank and condition, a third person may do so, and can recover the amount from the father, acting, however, at his own risk in determining whether the facts justify his interference. No evidence of a contract is required as in the English courts (see *ante*). The reciprocal rights of parent and child cease when the latter has attained his legal majority, but may be revived on either side. Thus if the adult child become a pauper, the parent would again be liable for its support; and, on the other hand, if the parent become a burden to the community, the adult child is responsible. The right of a parent to leave his property away from his children is undisputed at common law, but is in some cases restrained by statute; and if a child be left destitute without very strong reason, it will go far to prove the exertion of undue influence. The right to the custody of the child belongs to both parents. When the custody is disputed between the father and mother, the question may be brought before an equity court on petition, or before a court of common law by writ of *habeas corpus*. In the latter case, the child's preference is consulted if he be 14 years old or over, and if not, the court may use its discretion. In the English courts the superior right of a father to custody has been strongly upheld, and only the most flagrant conduct on his part has been thought to justify its restraint. In this country the courts are less restricted by this rule, but, *ceteris paribus*, will prefer the father to the mother (see DIVORCE). The parent has also the right to obedience and service on the part of his child, and may compel obedience by a reasonable exercise of force, as may also school-teachers or any persons standing *in loco parentis*. The father may collect his child's earnings, and may sue for damages caused by the loss of services from injuries inflicted by the defendant. This action is entirely distinct from that which may be brought in the child's name for his personal damage, pain, expenses, etc. The right of a father to sue for damages the seducer of his daughter is also based on the loss of service, but the jury are allowed to take into consideration the loss of reputation, etc., in fixing the amount of damages. See MEASURE OF DAMAGES. If the girl were a lawful apprentice, or had reached her majority, the actual relation of master and servant must exist to justify the action. Under the statutes of most states, an action may be brought by the child when the parent is killed through the negligence of a third party, a right which did not exist at common law. See NEGLIGENCE. The obligations due from a parent to an illegitimate child are those of support only. For this both the mother and the putative father are liable; and the liability may be enforced against the latter on suit either of the mother or of the local authorities in form and manner as by statute provided. See BASTARDS.

PARENTHESIS, a term originally Greek, and signifying *insertion* or *intercalation*, is in composition a clause, or part of a sentence or argument, not absolutely essential to the sense, but generally serving either for explanation or confirmation, sometimes chiefly for rhetorical effect. A parenthesis is usually included between the marks ( ), instead of which the *dash* (—) at the beginning and end of the parenthesis is frequently but improperly employed.

PAREPA-ROSA. See ROSA.

PAR'ESIS (Greek, "a letting go"). The technical term for incipient paralysis, no matter in what part of the body it be manifested. In non-medical parlance, the name is oftenest applied to softening of the brain. See PARALYSIS.

PARET, WILLIAM, D.D., LL.D., clergyman; b. New York, 1826; graduated at Hobart college, 1849; ordained priest, 1853; and consecrated Protestant Episcopal bishop of Maryland, 1885.

PARGA, a t. in European Turkey, in Albania, on a rocky peninsula, on the shore of the Mediterranean, opposite the island of Paxo, in lat. 39° 17′ n. and long. 20° 25′ e. It is on a steep cliff, on the summit of which is a small but almost impregnable citadel, and from which is a fine view of the adjacent country. It has a harbor defended by a small island, and carries on a thriving export trade in oil, wine, fruit, and tobacco. Parga was founded in the last days of the Roman empire, and has had importance in history since the beginning of the 15th century. It was independent, and under the protection of Venice from this period until the overthrow of the Venetian power by Napoleon in 1797, when it was for a short time governed by the French. In 1814 Ali Pasha, governor of Albania, besieged it, and the French refusing to defend it, the people applied to the English for aid, who took possession of the fortress. In 1819 Parga was given up to Turkey by the treaty of 1817, under the condition that those who chose to emigrate should have an asylum in the Ionian islands, and that their immovable property should be valued and paid for by the porte before embarkation. Pop. about 4,000.

PA'RIAHS is the name given to the lowest class of the population of India—to that class which, not belonging to any of the castes of the Brahmanical system, is shunned even by the lowest Hindu professing the Brahmanical religion, as touching a Pariah would render him impure. The Pariahs seem to belong to a negro race, as it appears from their

short woolly hair, flat nose, and thick lips; they are, besides, of short stature, and their propensities are of the coarsest kind. Despised by the Hindus, and ill used by the conquerors of India, they have, in some parts of India, gradually sunk so low that, to judge from the description which is given of their mode of living by different writers, it is scarcely possible to imagine a more degraded position than that which is occupied by these miserable beings.

PARIAH DOG. See CUR.

PARIAN. See POTTERY.

PARIAN CHRONICLE. See ARUNDEL MARBLES.

PARIDÆ AND PARUS. See TIT.

PARIETAL BONES. See SKULL.

PARIMA SIERRA, an irregular cluster of mountains sometimes called the Highlands of Guiana, in the s. of Venezuela, lat. 4° to 6° 30′ n., long. 64° to 67° w., and connected on the s.e. with the Sierra Pacaraima, thus forming a part of the great mountain system of South America, which consists of lofty ranges, generally bleak and barren, and of elevated plateau-like valleys, which afford pasturage, or are covered with forests; the valleys being about 2,000 ft. above the level of the sea, and sometimes 60 m. wide. These mountains in no part border on the sea, being separated by wide belts of lowland. Maravaca, 10,000 ft. high, and Duida, about 8,000 ft. high, are the highest points. The Essequibo, the Rio Branco, a branch of the Rio Negro, and the Orinoco rise among these mountains.

PARING AND BURNING consists in cutting off the surface of the soil in thin slices, which are then dried and burned. This is the most effectual way of reclaiming peat and other waste land, the surface of which is matted with coarse plants, difficult of decay. It is also applied advantageously to cold clay soils, apt to produce rank weeds and coarse grasses, which are to be broken up after lying for some time in grass. The ashes of the plants, consisting of potash and other salts, act as a powerful manure; while the clay, being reduced to the state of brick-dust, both improves the texture of the soil and acts as an absorbent for retaining moisture and nutritive gases, and giving them out to the roots of growing plants. On thin light soils the operation is rarely advisable, for much of the scanty volatile vegetable matter is dissipated; however, if care is taken to make the turfs merely smolder without flame, so that the plants are rather charred than burned, it is doubtful whether more dissipation takes place than if the plants were plowed down and allowed slowly to decay. The plot to be reclaimed should, if necessary, be dried by stone or tile drains: and all large stones grubbed up and carted or conveyed off upon sledges. The paring is to be done, if possible, in the months of April and May, in order to have the most favorable part of the year for drying the parings well before burning. There are plows specially made for paring, with a very flat share; but the best method is to employ the *breast-plow* or *paring spade*, as the surface is in most cases very irregular, and it is desirable to have the slices very thin. The parings should be burned directly they are sufficiently dry, as, after lying a month or six weeks, they begin to unite with the ground, and imbibe moisture from the young grass vegetating beneath them. Sometimes they can be burned as they lie, without being collected into heaps; and in this way the fire, in consuming the lingy side, which is undermost, chars the surface of the soil at the same time. If burned in heaps the heaps should be very small, in order to secure a good black ash, instead of the hard lumps of red ash produced by large fires. The weeds or refuse organic matters are thus only charred, instead of being entirely burned away; whilst the mineral matters are left in a soluble state instead of being reduced, as is too apt to be the case where the operation is carelessly conducted, into an insoluble semi-vitrified slag. To attain these desirable results a smoldering fire must be maintained, by keeping the outside layer of sods so close as to prevent the fire from kindling into flame. The ashes should be spread, care being taken to clear the bottoms of the heaps well out, so that the first crop may be free from patches.

PARINI, GIUSEPPE, 1729–99; b. in Bosisio, near Milan. He was of humble parentage, but cultivating his poetical faculty he soon became celebrated. In 1752 he published a volume of anacreontic poems, showing remarkable lyric talent. In 1763 he published the first part of his *Giorno*, a dramatic and didactic satire, which raised him to a high rank as a moral poet. By his success he obtained several important offices at Milan, occupied the chair of belles-lettres in the palatine schools, and that of eloquence in the college of Brera. He was appointed magistrate by Bonaparte. His works were published in 6 volumes in 1801–4.

PARIS, a genus of plants of the small endogenous or dictyogenous natural order *trilliaceæ*, of which one species, *P. quadrifolia*, called HERB PARIS, is not uncommon in moist shady woods in some parts of Britain. It is rarely more than a foot high, with one whorl of generally four leaves, and a solitary flower on the top of the stem, followed by a berry. The berry is reputed narcotic and poisonous, but its juice has been employed to cure inflammation of the eyes. The root has been used as an emetic.

PARIS, also called ALEXANDER, was, according to Homer, the second son of Priam and Hecabe, sovereigns of Troy. His mother dreamed during her pregnancy that she gave birth to a fire-brand, which set the whole city on fire, a dream interpreted by Æsacus or Cassandra to signify that Paris should originate a war which should end in the destruction of his native city. To prevent its realization Priam caused the infant to be exposed upon mount Ida by a shepherd named Agelaus, who found him, five days after, alive and well, a she-bear having given him suck. Agelaus brought him up as his own son, and he became a shepherd on mount Ida, distinguishing himself by his valor in protecting the other shepherds from their enemies—whence his name, Alexander, "the defender of men." An accident having revealed his parentage, old Priam became reconciled to his son, who married Œnone, daughter of the river-god Cebren. But his mother's dream was to come true for all that. He was appealed to, as umpire, in a strife which had arisen among the three goddesses, Hera (Juno), Athene (Minerva), and Aphrodite (Venus), as to which of them was the most beautiful, the goddess Eris (strife) having revengefully flung among them, at a feast to which she had not been invited, a golden apple (of discord) inscribed *To the Most Beautiful.* Each of the three endeavored to bribe him. Hera promised him dominion over Asia and wealth; Athene, military renown and wisdom; Aphrodite, the fairest of women for his wife—to wit, Helen, the wife of the Lacedæmonian king, Menelaus. Paris decided in favor of Aphrodite, hence the animosity which the other two goddesses displayed against the Trojans in the war that followed. Paris now proceeded to seek Helen, whom he carried away from Lacedæmon in her husband's absence. "The rape of Helen" is the legendary cause of the Trojan war, on account of which Paris incurred the hatred of his countrymen. He deceitfully slew Achilles in the temple of Apollo. He was himself wounded by a poisoned arrow, and went to mount Ida to be cured by Œnone, who possessed great powers of healing; but she avenged herself for his unfaithfulness to her by refusing to assist him, and he returned to Troy and died. He was often represented in ancient works of art, generally as a beardless youth, of somewhat effeminate beauty.

PARIS, city and co. seat of Edgar co., Ill.; on the Cleveland, Cincinnati, Chicago, and St. Louis and the Vandalia line railroads; 18 miles w. of Terre Haute, Ind. It is mainly a residence place, and has a public park of 70 acres, with artificial lake, electric lights, waterworks on the Holly system, national banks, several churches, graded public school, daily and weekly newspapers, and broom factories. Pop. '90, 4,996.

PARIS, city and co. seat of Bourbon co., Ky.; on Stoner fork of the Licking river and the Louisville and Nashville and the Kentucky Midland railroads; 80 miles s. of Cincinnati, O. It was settled in 1784, and chartered as a city in 1862. There are a courthouse (cost $125,000), high school, classical institute, preparatory school, high school for colored pupils, gas and electric lights, waterworks supplied from Stoner fork, several state banks, and weekly newspapers. The principal industries are distilling bourbon whisky and trading in blue grass seed. Pop. '90, 4,218.

PARIS (the ancient *Lutetia Parisiorum*), the metropolis of France, is situated in 48° 50′ n. lat., and 2° 20′ e. long., on the Seine, about 110 m. from its mouth. The population of the city was, in 1869, 1,875,000; in 1872, 1,799,250; and in 1896, 2,536,834. Its circumference is about 22 miles. It lies in a hollow, about 200 ft. above the level of the sea, and is surrounded by low hills, which in their highest ranges to the n. only attain an elevation of 290 or 300 ft., as at Montmartre and Belleville. These hills, which are separated by narrow valleys or plateaus, as those of St. Denis to the n., Ivry to the e., Montrouge to the s., and Grenelle to the s.w., are encircled at a distance of from two to five miles by an outer range of heights, including Villejuif, Meudon, St. Cloud, and Mont-Valérien, the highest point in the immediate vicinity of the city. The Seine, which enters Paris in the s.e. at Bercy, and leaves it at Passy in the w., divides the city into two parts, and forms the two islands of La Cité and St. Louis, which are both covered with buildings.

The earliest notice of Paris occurs in Julius Cæsar's *Commentaries,* in which it is described under the name of Lutetia, as a collection of mud huts, composing the chief settlement of the Parisii, a Gallic tribe conquered by the Romans. The ruins of the Palatium Thermarum (Palais des Thermes), and of ancient altars, aqueducts, and other buildings, show that even in Roman times the town extended to both banks of the Seine. Lutetia began in the 4th c. to be known as Parisia, or Paris, from the Celtic tribe of the Parisii, to whom it belonged. In the 6th c. Paris was chosen by Clovis as the seat of government; and after having fallen into decay under the Carlovingian kings, in whose time it suffered severely from frequent invasions of the Northmen, it finally became in the 10th c. the residence of Hugh Capet, the founder of the Capetian dynasty, and the capital of the Frankish monarchy. From this period Paris continued rapidly to increase, and in two centuries it had doubled in size and population. In the middle ages Paris was divided into three distinct parts—La Cité, on the islands; the Ville, on the right bank; and the quartier Latin, or university, on the left bank of the river. Louis XI. did much to enlarge Paris, and to efface the disastrous results of its hostile occupation by the English during the wars under Henry V. and Henry VI. of England; but its progress was again checked during the wars of the last of the Valois, when the city had to sustain several sieges. On the accession of Henri IV. of Navarre in 1589, a new era was opened to Paris. The improvements commenced under his reign were continued under

the minority of his son, Louis XIII. Louis XIV. converted the old ramparts into public walks or *boulevards*, organized a regular system of police, established drainage and sewerage works, founded hospitals, almshouses, public schools, scientific societies, and a library, and thus gave to Paris a claim to be regarded as the focus of European civilization. The terrible days of the revolution caused a temporary reaction. The improvement of Paris was recommenced on a new and grander scale under the first Napoleon, when new quays, bridges, markets, streets, squares, and public gardens were created. All the treasures of art and science which conquest placed in his power were applied to the embellishment of Paris, in the restoration of which he spent more than £4,000,000 sterling in twelve years. His downfall again arrested progress, and in many respects Paris fell behind other European cities.

Renovation of various sorts was recommenced under Louis-Philippe; but as lately as 1834, much of the old style of things remained; the gutters ran down the middle of the streets, there was little underground drainage from the houses, oil lamps were suspended on cords over the middle of the thoroughfares, and, except in one or two streets, there were no side-pavements. It was reserved for Napoleon III. to render Paris the most commodious, splendid, and beautiful of modern cities. When he commenced his improvements, Paris still consisted, in the main, of a labyrinth of narrow, dark, and ill-ventilated streets. He resolved to pierce broad and straight thoroughfares through the midst of these, to preserve and connect all the finest existing squares and boulevards; and in lieu of the old houses pulled down in the heart of the town, to construct, in a ring outside of it, a new city in the most approved style of modern architecture. With the assistance of Baron Hausmann, the prefect of the Seine, his schemes were carried out with rare energy and good taste. Two straight and wide thoroughfares, parallel to and near each other, crossed the whole width of Paris from n. to s. through the Cité; a still greater thoroughfare was made to run the whole length of the town, n. of the Seine, from e. to west. The old boulevards were completed so as to form outer and inner circles of spacious streets—the former chiefly lying along the outskirts of the old city, the latter passing through and connecting a long line of distant suburbs. In the year 1867, when the international exhibition was opened, Paris had become in all respects the most splendid city in Europe; and in that year it was visited by upwards of a million and a half of foreigners. Many further improvements were then contemplated. New botanical and zoological gardens were to be formed; the museums and class-rooms of the Jardin des Plantes were to be rebuilt; an underground railway was to be formed, crossing Paris from e. to w.; Montmartre was to be leveled, and the Seine was to be deepened up to Grenelle, the point where it leaves the town; and there a harbor was to be formed for sea-going ships, which was to convert Paris into a *port de mer*. Financial and political difficulties were, however, at hand (see FRANCE), and these great schemes had to be postponed. The siege of Paris by the Germans, which lasted from Sept. 19, 1870, to Jan. 28, 1871, caused much less injury to the city than might have been expected—it was reserved for a section of the Parisian population to commit an act of vandalism without a parallel in modern times. On Mar. 18, the red republicans, who had risen against the government, took possession of Paris. On Mar. 27, the commune was declared the only lawful government. Acts of pillage and wanton destruction followed. On May 15, the column erected to the memory of Napoleon and the great army, in the Place Vendôme, one of the principal squares of Paris, was solemnly pulled down as "a monument of tyranny." The government troops under Marshal MacMahon attacked the insurgents, and kept them from doing further mischief. The former succeeded in entering Paris on May 20, and next day the communists began systematically to set fire with petroleum to a great number of the chief buildings of Paris, public and private. The fire for a time threatened to destroy the whole city. It raged with the greatest fury on the 24th, and was not checked until property had been lost to the value of many millions sterling, and historical monuments were destroyed which never can be replaced. The horror inspired by the commune for a time drove the wealthy classes from Paris, and it was feared that it would lose its prestige as a European capital. This, however, has not proved to be the case. In the autumn of 1873, all the private houses burnt had been rebuilt—the monuments only partially injured had been restored, and the streets and public places were as splendid and gay as in the best days of the empire. There remained, however, to recall the commune, the blackened ruins of the Tuileries, the Hôtel de Ville, and two or three other buildings to which we are about to refer.

The Seine, in passing through Paris is spanned by 30 bridges. The most celebrated and ancient are the Pont Notre-Dame, erected in 1500, and the Pont Neuf, begun in 1578, completed by Henri IV. in 1604, and thoroughly renovated in 1852. This bridge, which crosses the Seine at the n. of the Ile-de-la-Cité, is 1080 ft. long, and abuts near the middle on a small peninsula, jutting out into the river, and planted with trees, which form a background to the statue of Henri IV. on horseback, which stands in the central open space on the bridge. Among the other bridges, the handsomest are the Pont de la Concorde, 160 yards long, built in 1787–90; the Pont du Carrousel, Pont d'Austerlitz, and the Pont d'Jéna, both of the time of the first empire; and the Pont des Invalides, Pont de l'Alma, and Pont de Solférino—all handsome structures, adorned with military and naval trophies, commemorative of events and victories connected with the second empire. These bridges all communicate directly with the spacious quays, planted with

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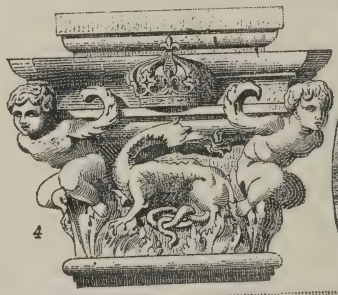

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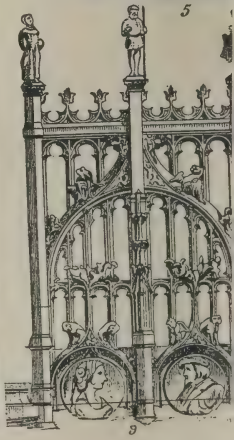

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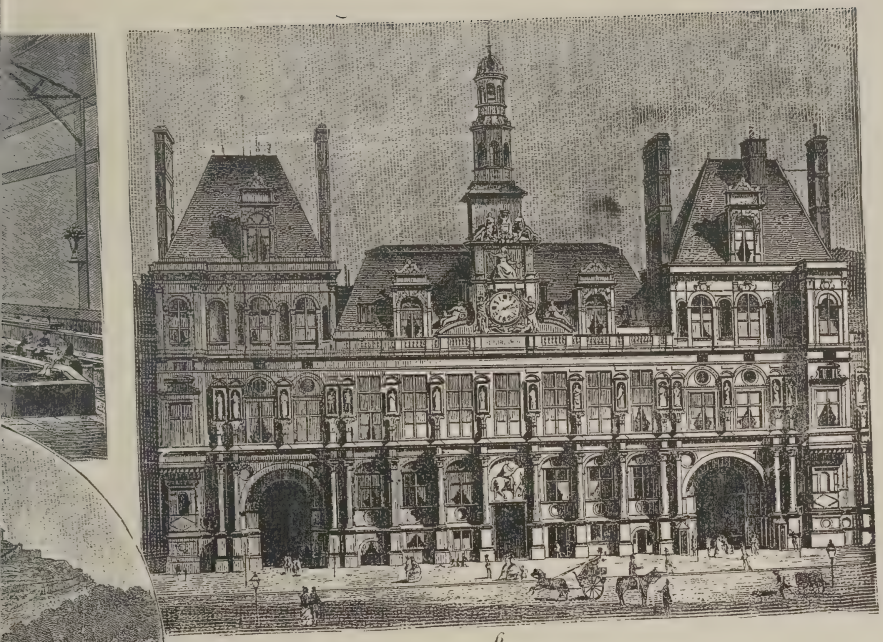
PARIS.—1. Drinking fountain. 2. Public laundry. 3. Capital from palace of Franc
l'Etoile. 8. Interior of the Madeleine. 9. Gothic stone-work.



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I. ; 4, from palace of Fontainebleau. 5. Mont St. Valérien. 6. Hotel de Ville. 7. Arc de

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trees, which line both banks of the Seine, and which, together with the boulevards, give special characteristic beauty to the city. Although the most ancient quays—as those des Augustins and de la Mégisserie—date from the 14th c., the greater part of these magnificent embankments, measuring 12 m. in extent, is due to the first Napoleon and the late emperor.

Before speaking in detail of the streets, boulevards, and places or squares of Paris, it is proper to mention that the private houses as well as the public buildings are built of a light-colored kind of limestone, easily wrought and carved ornamentally. With this material they are reared in huge blocks, rising to a height of six or seven stories, each floor constituting a distinct dwelling; access to all the floors in a tenement being gained by a common stair, which is usually placed under the charge of a porter at the entrance. Very frequently the tenements surround an open quadrangle, to which there is a spacious entry, the gate of which is kept by a porter for the whole inhabitants of the several stairs. In these respects, therefore, Paris differs entirely from London; for instead of extending rows of small brick buildings of a temporary kind over vast spaces, the plan consists of piling durable houses on the top of each other, and confining the population to a comparatively limited area. In the great new streets which were formed in the time of the late emperor, this general plan has been adhered to, but with this difference, that instead of being narrow and crooked, they are wide and straight. Among the finest of them are the Rue de Rivoli, 2 m. in length, the Rue de la Paix, the Rue du Faubourg St. Honoré, and the Rue Royale. The boulevards, which extend in a semicircular line on the right side of the Seine, between the nucleus of the city and its surrounding quarters, present the most striking feature of Paris life. In all the better parts of the city they are lined with trees, seats, and little towers called *Vespasiennes*, covered with advertisements. Restaurants, cafés, shops, and various places of amusement succeed one another for miles, their character varying from the height of luxury and elegance in the western Boulevard des Italiens, to the homely simplicity of the eastern Boulevards Beaumarchais and St. Denis. Among the public squares or *places*, the most noteworthy is the Place de la Concorde, which connects the gardens of the Tuileries with the Champs Elysées, and embraces a magnificent view of some of the finest buildings and gardens of Paris. In the centre is the famous obelisk of Luxor, covered over its entire height of 76 ft. with hieroglyphics. It was brought from Egypt to France, and in 1836 placed where it now stands. On the site of this obelisk stood the revolutionary guillotine, at which perished Louis XVI., Marie Antoinette, Philippe Egalité, Danton, Robespierre, and a host of other victims. Of the other squares, the following are some of the most handsome. The Place du Carrousel, between the Tuileries and Louvre; the Place Vendôme, already referred to, with Napoleon's column of victory; the Place de la Bastille, where once stood that famous prison and fortress; the Place Royale, with its two fountains and a statue of Louis XIII.; the Place de l'Hôtel de Ville, formerly Place de la Grève, for many ages the scene of public executions, and the spot at which some of the bloodiest deeds of the revolution were perpetrated. The Porte St. Martin and Porte St. Denis, which were erected by Louis XIV. to commemorate his victories in the Low Countries, and are adorned with bas-reliefs representing events of these campaigns, mark the ancient limits of the most turbulent quarters of the Paris of the past; while the Arc de l'Etoile, begun by Napoleon in 1806, and completed in 1836 at a cost of more than $2,000,000, may be said to form the extreme western boundary of the aristocratic quarters. This arch, which bounds the Champs Élysées, has a total height of 160 ft. and a breadth of 146. It is profusely adorned with bas-reliefs and alto-reliefs, representing victories of Napoleon, which were injured during the bombardment of Paris, but which have since undergone a complete restoration. (See accompanying illus.). The great streets which radiate from the Arc de Triomphe were among the most magnificent of those constructed during the imperial *Régime*, and they still form the finest quarter of Paris. The Eiffel tower is situated in the Champ de Mars and rises to a height of 985 ft.

The palace of the Tuileries (q.v.) was begun in 1566 by Catherine de' Medici, and enlarged by successive monarchs, while used as a royal residence, until it formed a structure nearly a quarter of a mile in length, running at right angles to the Seine. To the e. of the Tuileries, at a distance of more than a quarter of a mile, was erected the palace of the Louvre, forming a square of 576 ft. by 538 ft., remarkable, especially the eastern façade, for its architectural beauty. The Louvre long since ceased to be a royal residence, and has been converted into a public museum of antiquities. It was connected with the Tuileries by a great picture gallery overlooking the Seine, and 1456 ft. in length. N. of the picture gallery, and between the two palaces, lay the Place du Carrousel, into the northern side of which, at the accession of Napoleon III., there intruded a mass of poor and narrow streets. One of the emperor's earliest improvements was to remove these buildings, and connect the Tuileries and Louvre on the northern side, throwing them into one vast building, forming the most magnificent palatial structure in the world. The Tuileries continued to be occupied as the residence of the imperial family; but the Louvre proper formed a series of great galleries filled with pictures, sculptures, and collections of Egyptian, Greek, and Roman antiquities. The communists attempted to burn the whole pile, but fortunately only succeeded in destroying the Tuileries (of which the main portion is not to be rebuilt) and a corner of the Louvre. The library of the Louvre, with its contents, was burned, but the rest of the building and its priceless treasures were

saved. A large sum was voted by the government for the restoration of the Louvre, and this work was at once undertaken and carried forward with the utmost dispatch. N. of the injured part of the Louvre is the Palais Royal (q.v.), the most valuable part of which, fronting the Rue St. Honoré, was set fire to by order of the commune in 1871. The palace of the Luxembourg, on the s. side of the Seine, was built by Marie de' Medici in the Florentine style. It contains many magnificent rooms, some of which have been employed as picture galleries for the works of modern artists. The Luxembourg was formerly the house of the peers, but since 1871 it has been used as the Hôtel de Ville, On the n. bank of the Seine, opposite the island of the Cité, is the site of the Hôtel de Ville, which, before its destruction by the commune, was one of the most magnificent buildings in Paris. (See accompanying illus.) It was the residence of the prefect of the Seine, who held a sort of court there, and included all the offices for the transaction of the municipal business of Paris. It was commenced under Francis I., but had been trebled in extent by recent additions. The statues and rich ornaments with which it was decorated have been almost entirely destroyed, but the building has been again carefully rebuilt in the style of its predecessor. Not far from the Hôtel de Ville, on the northern bank of the Cité, stands the Palais de Justice, a vast building, also set fire to by the commune; some parts of it date from the 14th c., and others are modern. It is the seat of some of the courts of law, as the court of cassation, the imperial court, the tribunals of the first appeal and of police. The old palace was not much injured by the fire; but the new portion which was constructed during the reign of Napoleon III., and much admired for its architecture, was left in ruins. Within the precincts of this palace are the Sainte Chapelle, and the noted old prison of the Conciergerie, in which Marie Antoinette, Danton, and Robespierre were successively confined.

The Conciergerie, just mentioned, in which prisoners are lodged pending their trial, constitutes one of the eight prisons of Paris, of which the principal is La Force. The Nouveau Bicêtre is designed for convicts sentenced to penal servitude for life; St. Pélagie receives political offenders, St. Lazare is exclusively for women, the Madelonnettes for juvenile criminals, and Clichy for debtors.

The number of the institutions of benevolence is enormous. The largest of the numerous hospices or almshouses is La Salpêtrière, probably the largest asylum in the world, extending over 78 acres of land, and appropriated solely to old women, 1300 of its 4,500 inmates being insane patients; Bicêtre, with nearly 3,600 beds, receives only men. The Hospice des Enfans Trouvés, or foundling hospital, provides for the infants brought to it till they reach the age of maturity, and only demands payment in the event of a child being reclaimed. The Crèches, or public nurseries, first established in 1844, of which there are now 18, receive the infants of poor women for the day at the cost of 20 centimes. Besides institutions for the blind, deaf and dumb, convalescents, sick children, etc., Paris has 17 general and special hospitals. Of these the oldest and most noted are the Hôtel Dieu, re-built at a cost of $9,000,000; La Charité; and La Pitié.

The chief institutions connected with the University of France, and with education generally, are still situated in the Quartier Latin. The Sorbonne (q.v.), a large building erected by Cardinal Richelieu for the faculties of the old University of Paris, contains lecture halls and class-rooms, and an extensive library open to the public. There degrees are granted by the University of France in the faculties of science, letters, and theology, and gratuitous public lectures are delivered, which are attended by a large number of students. Near the Sorbonne is the Collége de France, where gratuitous public lectures are also delivered by eminent scholars and men of letters. The Ecole Polytechnique, the school of medicine and the school of law, the observatory, and the Jardin des Plantes, with its great museum of natural history, lecture-rooms, and botanical and zoological gardens, are situated in the same quarter of Paris. The principal of the public libraries is that of the Rue Richelieu, now called the Bibliothèque Nationale, which contains more than 3,000,000 volumes, 100,000 manuscripts, many portfolios of engravings, and a collection of 400,000 coins and medals (see LIBRARIES), which originated in a small collection of books placed by Louis XI. in the Louvre. No city on this side of the Alps is richer than Paris in fine-art collections, and among these the museums at the Louvre stand pre-eminent. The Palais des Beaux-arts is used as an exhibition of art, manufactures, and architectural models. The Hôtel Cluny, connected underground with the Palais des Thermes, in addition to its being in itself a most interesting monument of mediæval art, contains curious relics of the arts and usages of the French people, from the earliest ages of their history to the renaissance period. The mint deserves notice for the perfection of its machinery. The Gobelins, or tapestry manufactory, may be included under the fine arts, as the productions of its looms are all manual, and demand great artistic skill. The Conservatoire des Arts et Métiers, in the Rue St. Martin, contains a great collection of models of machinery, and class-rooms for the instruction of workmen in all departments of applied science. The palace of industry, built in 1854 for the universal exhibition, now forms a permanent exhibition. The spacious building in which the exhibition of 1878 took place was named Palace of the Trocadéro.

Among the large number of parish churches of Paris, the grandest and most interesting, in an historic point of view, is the cathedral of Notre Dame, which stands on a site successively occupied by a Pagan temple and a Christian basilica of the time of

the Merovingian kings. The present building was constructed between the 12th and 15th centuries; and in its present state of restored magnificence it may rank as one of the noblest specimens of Gothic architecture. St. Germain-des-Prés, which is probably the most ancient church in Paris, was completed in 1163; St. Etienne du Mont and St. Germain l'Auxerrois, both ancient, are interesting—the former for its picturesque and quaint decorations, and for containing the tomb of St. Geneviève, the patron saint of Paris; and the latter for its rich decorations and the frescoed portal, restored at the wish of Margaret of Valois. The Sainte Chapelle, built by St. Louis in 1245–48, for the reception of the various relics which he had brought from the Holy Land, is one of the most remarkable buildings in Paris, profusely decorated in all parts with brilliantly colored materials. Its present beauty is entirely due to the restorations completed by the late emperor at a cost of $250,000. It was threatened by the commune, but saved. Among modern churches are the Madeleine, built in imitation of a Greek temple, and gorgeous with gildings, frescoes, carvings, marbles, and statues (see accompanying illus.); and the Pantheon, which was begun as a church, but converted by the constituent assembly of republican France into a temple dedicated to the great men of the nation—it was restored to the church by the late emperor, and rededicated to St. Geneviève; Notre Dame de Lorette, erected in 1823, a flagrant specimen of the meretricious taste of the day; and St. Vincent de Paul, completed in 1844, somewhat more imposing in style, etc. Among the few Protestant churches, l'Oratoire is the largest and the best known.

Paris abounds in theaters and places of amusement suited to the tastes and means of every class. The leading houses, as the Opéra, Théâtre Français—chiefly devoted to classical French drama—Odéon, Théâtre Italien, etc., receive a subvention from government, and all are under strict police supervision. The new opera house, completed in 1875, is a wonderfully magnificent building, costing, exclusive of the site, $5,600,000. Cheap concerts, equestrian performances, and public balls, held in the open air in summer, supply a constant round of gayety to the burgher and working classes at a moderate cost, and form a characteristic feature of Paris life; while, in addition to the noble gardens of the various imperial palaces, the most densely crowded parts of the city have public gardens, shaded by trees, and adorned with fountains and statues, which afford the means of health and recreation to the poor. Beyond the fortifications at the w. of Paris is the Bois de Boulogne, converted by the late emperor from a wood covered with stunted trees into one of the most beautiful gardens in Europe. That part of it which skirted the fortifications was cut up and destroyed during the siege, but since then it has been replanted, and is now as attractive to visitors as it has ever been.

Paris has quite a number of cemeteries, of which the principal one is Père-la Chaise, extending over 110 acres, and filled in every part with monuments erected to the memory of the countless number of celebrated persons who have been buried here. The morgue is a building in which the bodies of unknown persons who have met with a violent death are placed, and which, if not claimed within three days, are buried at the public expense. The southern parts of the city are built over beds of limestone, rich in fossils, which have been so extensively quarried as to have become a mere net-work of vast caverns, which in some cases scarcely afford sufficient support to the houses above. These quarries were first converted in 1784 into catacombs, in which are deposited the bones of the dead, collected from the ancient cemeteries of Paris.

Paris was surrounded, under Louis Philippe, with fortifications extending 30 miles round, and costing $27,500,000, and, in addition to these, 17 detached forts have been erected at definite distances from one another. The Champ-de-Mars is a vast sandy plain near the Quai d'Orsay, on which reviews and other military displays and national festivals are held. Close to it stands the École Militaire, founded in 1752, and used as barracks for infantry and cavalry, of which it can accommodate 10,000 men, with space for 800 horses. The Hôtel des Invalides, founded in 1670 for disabled soldiers, is situated on the left bank of the river. The crypt of the church contains the sarcophagus, hewn from a huge block of Russian granite, in which lie the remains of Napoleon, deposited there in 1840.

Paris is divided into 20 arrondissements. The prefect of the Seine is the chief of the municipal government, and is appointed by the government. There is a large municipal council, chosen by popular election. Each arrondissement has a mayor and two assistant councilors. The prefect of police is at the head of the civic guard or gensdarmes, the fire brigade, and the sergents de ville, or city police, who are armed with swords. The cleaning, sewerage, and water supplies of Paris are under the charge of the prefect. Paris is now abundantly supplied with pure and wholesome water; since 1854 the length of vaulted sewers has been doubled, and now amounts to upwards of 250 miles. The same may be said in regard to the paving of the city, and the street-lighting is now adequately effected by means of electric and gas-lights. For the year 1896 revenue was estimated to be 336,738,175 francs, and the expenditure the same. Large cattle markets are held near the licensed *abattoirs* (q.v.). There are in the heart of the city numerous *halles*, or wholesale, and *marchés*, or retail markets. The principal of these is the Halles Centrales, near the church of St. Eustache, covering nearly 20 acres. Among the older markets, the Halle aux Vins, in which 500,000 casks of wine can be stowed, and the Marché aux Fleurs, are perhaps the most interesting.

For an account of Paris, see *Le Nouveau Paris* by Labedolière; *Paris Illustré en*

1870, by Ad. Joanne (Paris, 1870 and 1871); and Moriac's *Paris sous la Commune* (Paris, 1871). A great work, which was to include all the principal documents connected with the history of Paris, was commenced during the late empire, under the supervision of M. Hausmann. Seven large quarto volumes had appeared when the work was interrupted by the events of 1871. See Kaufmann, *Paris of To-day* (1891).

PARIS, John Ayrton, 1785–1856, b. England; educated at Cambridge, where he took a medical degree after a course of medical study at Edinburgh. He began the practice of his profession in London, and in his 23d year was made physician to Westminster hospital. Soon afterwards he settled in Cornwall, where he obtained a large practice. He pursued the study of natural history, founded the royal geological society of Cornwall, and wrote a *Guide to Mount's Bay and Land's End*, describing the geology of that part of Cornwall. He also wrote, while in Cornwall, *Memoirs of the Life and Scientific Labors of the late Rev. W. Gregor*. Returning to London, he lectured on the materia medica at the Windmill-street school of medicine, and on the philosophy of medicine at the Royal College of Physicians. He worked over the substance of these lectures into the introduction of his *Pharmacologia*, which passed through many editions, and still ranks as a valuable text-book on the materia medica. He also wrote a *Treatise on Diet;* a *Life of Sir Humphrey Davy;* and anonymously *Philosophy in Sport made Science in Earnest*. He became a censor of the college of physicians in 1817, delivered the Harveian oration before it in 1843, and the next year succeeded sir Henry Halford in its presidency, retaining that office till his death.

PARIS, Louis Philippe d'Orléans, Comte de, b. in Paris, 1838; son of the duc d'Orléans and grandson of Louis Philippe, king of France; educated in Germany and England. After a journey to Syria with his brother, the duc de Chartres, in 1859, he published a journal of the voyage entitled *Damas et le Libau*. Early in 1861 he became interested in the American war between the states, offered his services, with his brother's, to the union cause, and Sept. 28 was made aid-de-camp to Gen. McClellan, with the rank of capt. He remained in active and efficient service in all the disastrous battles of that campaign, and retired from the service when the attitude of France towards Mexico gave cause of offense to the United States. He returned to England in the summer of 1862, and in Feb., 1863, published in the *Revue des Deux-Mondes* an article entitled *La Sémaine de Noel dans la Lancashire* over the signature of Eugéne Forcade. In 1867–68 he published in the same magazine, under the *nom de plume* of *d'x-Raymond*, a letter on new Germany, and a study of the state church and the free church in Ireland. In 1869 he published a book entitled *Les Associations Ouvrières en Angleterre* (Trades Unions), which went through many editions in Paris, and has been translated into several languages. During the misfortunes of the German war the count and his brother offered their services in the French army in whatever place they might be assigned; but were refused by the legislative assembly. In 1873 he made a formal resignation of the claims of his family to the throne of France, by a visit to the comte de Chambord at Frohsdorff. His best-known work is, *Une Histoire de la Guerre Civile en Amérique* (1874–89). He married, May 30, 1864, Marie Isabel, daughter of the duc de Montpensier, by whom he had eight children. In 1890, he re-visited the United States, and was received with much cordiality. He d. in 1894.

PARIS, Matthew, the best Latin chronicler of the 13th c., was b. about 1195, and in 1217 entered the Benedictine monastery of St. Albans. After the departure of Roger of Wendover, in 1235, Paris was chosen to succeed him as annalist of the monastery. He discharged his functions with veracity and boldness, in consequence of which he greatly displeased some of his contemporaries. The principal external incident of his life was his voyage to Norway, whither he was invited by king Hakon, to repair the financial disorders in the Benedictine monastery of Holm. Paris landed at Bergen, July 10, 1248, was courteously received by the Norwegian monarch, and settled the business about which he came in a satisfactory manner. After his return to England he stood high in the favor of Henry III., who used to converse with him in the most familiar manner, and from whose lips he derived not a little of the information that makes his *Chronicle* so valuable. He had also a wide circle of influential friends and acquaintances among the clergy, from whom he obtained materials for his work. His death occurred in 1259. Paris had a great reputation in his day for his virtues and abilities. He was considered a universal scholar, and is said by his laudatory biographers to have been versed in mathematics, poetry, oratory, divinity, history, painting, and architecture. One thing about him long kept his memory green in the hearts of his countrymen—he was a patriotic Englishman, and though a sincere Catholic (like all good men of his age), yet he loved his country better than the pope, and wrote so fiercely against the encroachments of the court of Rome in ecclesiastical matters that his *Chronicle* became, in after times, a great favorite with the reformers. Paris's principal work is his *Historia Major*, which begins with the Norman conquest, and extends to the year of the author's death. It was continued by William Rishanger, also a monk of St. Albans, till the death of Henry III. in 1272. The first edition was published at London by archbishop Parker in 1571, and was reproduced at Zürich in 1606; later and more complete editions are those of London in 1640–41, and in 1684. The only portion of the *Historia Major*, how-

ever, which is properly the work of Paris is that extending from 1235 to 1259; the previous part being nearly a transcription from the *Flores Historiarum*, attributed to Roger of Wendover, whence some critics have supposed that Paris is really the author of that work too. But this opinion is strenuously contested by the most recent editor of the *Flores Historiarum*, the Rev. H. O. Coxe (4 vols. 1841–42). Translations both of Paris's *Chronicle* and that of Roger of Wendover have been published by Bohn in his Antiquarian library. The British museum, and the library of Corpus Christi college at Cambridge, contain manuscript abridgments of the *Historia Major*, made by Paris himself, and entitled *Chronica Majora Sancte Albani;* a second abridgment is known as the *Historia Minor*. Other works of Paris's are *Duorum Offarum Merciorum Regum Vitæ; Viginti trium Abbatum, S. Albani Vitæ;* and *Additamenta*, being explanatory additions to his *Historia Major*.

PARIS BASIN, the collective name of the beds of eocene age, which rest in a hollow of the chalk in the district around Paris, where they occupy an oblong area measuring 180 m. in greatest length from n. to s., and 90 m. in breadth from e. to west. The different sections into which the series has been divided are given under eocene (q.v.). The beds are chiefly remarkable for the rich harvest of organic remains which they supplied to Cuvier, and which led to the foundation of the modern science of palæontology. The strata from which these were principally obtained consist of a series of white and green marls with subordinate beds of gypsum; they are largely developed at Montmartre, where the gypsum has been extensively quarried for the manufacture of plaster of Paris. The fossils consist of land and fluviatile shells, fresh-water fish and crocodiles, and the bones of birds and quadrupeds, besides a few land-plants, among which are some palms. The mammals, of which about 50 species have been described, belong to the order pachydermata. The Paris basin has for some time almost ceased to supply the remains of vertebrate animals.

PARIS GREEN. See Arsenious Acid.

PARISH (Gr. *paroikia*, habitation, from *para*, near, and *oikeomai*, I dwell; Lat. *parochia*), the district assigned to a particular church, where the inhabitants of the district may attend at public worship, and receive the sacramental or other ministrations of the clergy. The name originally seems to have been interchangeable with *diœcesis*, "diocese," and to have been applied to the district subject to the spiritual jurisdiction of a bishop; and, on the other hand, at a later period, *diœcesis* was sometimes used to signify a parochial church or district. The distribution into parishes appears to be comparatively modern. Originally, all the clergy were (in the opinion of the Episcopalian churches) but coadjutors of the bishop, and served in his church, at which all the faithful assembled. At Alexandria, and afterwards at Rome, a number of minor churches were opened (called at Rome *tituli*), which were served by clergy originally not permanently attached to them, but sent from the principal or bishop's church, but in progress of time fixed permanently in the charge. This, however, was not common; and we find churches, with clergy permanently attached, much earlier in rural districts than in cities. The institution does not appear to have become general till the 9th or 10th century. In England, the first legislation on the subject occurs in the laws of Edgar, about 970. The parochial division of districts seems in great measure to have followed the civil distribution into manors, or other feudal divisions of territory; and it is probable that it is to the same state of things we owe the practice of lay patronage, the priest officiating in a manorial church being chosen, with the bishop's consent, by the lord of the manor. The parochial revenue, however, by no means followed the same rules which now prevail. At first, all ecclesiastical income, from whatever district, was carried into a common fund, which was placed at the disposal of the bishop, and was generally divided into four parts—for the bishop, for the clergy, for the poor, and for the church. By degrees, however, beginning first with the rural parishes, and ultimately extending to those of the cities, the parochial revenues were placed at the disposal of the parish clergy (subject to the same general threefold division, for the clergy, for the poor, and for the church), and in some places an abusive claim, which was early reprobated, arose upon the part of the lord of the manor to a portion of the revenue. Properly, a parish has but one church; but when the district is extensive, one or more minor (*succursal*) churches, sometimes called "chapels of ease," are permitted.

In the law of England, a parish is an important subdivision of the country, for purposes of local self-government, most of the local rates and taxes being confined within that area, and to a certain extent self-imposed by the parties who pay them. The origin of the division of England into parishes is not very clearly ascertained by the authorities. Some have asserted that the division had an ecclesiastical origin, and that a parish was merely a district sufficient for one priest to attend to. But others have asserted that parishes had a civil origin long anterior to ecclesiastical distinctions, advantage being merely taken to ingraft these on so convenient an existing subdivision of the country: and that a parish was a subdivision of the ancient hundred, known as a vill or town, and through its machinery the public taxes were anciently collected. Hobart fixes the date of the institution of civil parishes in 1179, and his account has been generally followed. Much difficulty has occasionally arisen in fixing the boundaries of parishes. Blackstone says the boundaries of parishes were originally ascertained by those of manors, and that

it very seldom happened that a manor extended itself over more parishes than one, though there were often many manors in one parish. Nevertheless, the boundaries of parishes are often intermixed, which Blackstone accounts for by the practice of the lords of adjoining manors obliging their tenants to appropriate their tithes towards the officiating minister of the church, which was built for the whole. Even in the present day, these boundaries often give rise to litigation, and the courts have always decided the question according to the proof of custom. This custom is chiefly established by the ancient practice of perambulating the parish in Rogation-week in each year. See PERAMBULATION. There are some places as to which it is uncertain whether they are parishes or not, and hence it has been usual to call them reputed parishes. There are also places called extra-parochial places, which do not belong to any parish, such as forest and abbey lands. In these cases the persons inhabiting were not subject to the usual parochial rates and taxes, and other incidents of parochial life. But in 1857 a statute was passed which put extra-parochial places upon a similar footing to parishes, by giving power to justices, and in some cases to the poor-law board, to annex them to adjoining parishes, after which they are dealt with in much the same way as other places. One of the chief characteristics of a parish is that there is a parish church, and an incumbent and churchwardens attached to it, and by this machinery the spiritual wants of the parishioners are attended to. These several parish churches, and the endowments connected therewith, belong in a certain sense to the nation, and the incumbents are members of the established church of England, and amenable to the discipline of the bishops and the spiritual courts. The private patronage, or right of presenting a clergyman to an incumbency, is technically called an advowson, and is generally held by an individual as a salable property, having a market value. The patron has an absolute right (quite irrespective of the wishes of the parishioners) to present a clerk or ordained priest of the church of England to a vacant benefice, and it is for the bishop to see to his qualifications. The bishop is the sole judge of these qualifications, and if he approves of them, the clerk or priest is instituted and inducted into the benefice, which ceremony completes his legal title to the fruits of the benefice. The incumbents of parish churches are called rectors, or vicars, or perpetual curates, the distinction being chiefly founded on the state of the tithes. When the benefice is full, then the freehold of the church vests in the rector or parson, and so does the church-yard; but he holds these only as a trustee for the use of the parishioners. There are certain duties which the incumbent of the parish church is bound by law to perform for the benefit of the parishioners. He is bound, as a general rule, to reside in the parish, so as to be ready to administer the rites of the church to them. The first duty of the incumbent is to perform public worship in the parish church every Sunday, according to the form prescribed by the Book of Common Prayer, which is a part of the statute law of England. He must adhere strictly to the forms and ceremonies, and even to the dress prescribed by the Book of Common Prayer and Canons. The incumbent is also bound to baptize the children of all the parishioners, and to administer the rite of the Lord's-supper to the parishioners not less than three times each year. The incumbent is also bound to allow the parishioners to be buried in the church-yard of the parish, if there is accommodation, and to read the burial service at each interment. He is also bound to marry the parishioners on their tendering themselves, and complying with the marriage acts, within the parish church and during canonical hours, and it is said he is liable to an action of damages if he refuse. In respect of burials and marriages, certain fees are frequently payable by custom; but unless such a custom exists, no fee is exigible for performance of these duties. In many cases, where one church had become insufficient for the increased population, the old parish has been subdivided under the church building acts, the first of which was passed in 1818, into two or more ecclesiastical districts or parishes, for each of which a new church was built, and an incumbent appointed. The incumbents in these ecclesiastical parishes have generally been provided for by the incumbent of the mother-parish or by voluntary benefactors, and by the aid of pew-rents. But these ecclesiastical parishes, so far as the poor and other secular purposes are concerned, make no change on the old law. Another incident of the parish church is that there must be churchwardens appointed annually, who are accordingly leading parochial officers, and whose duty is partly ecclesiastical and partly civil. Their civil duties consist chiefly in this, that they must join the overseers in many of the duties arising out of the management of the poor, and incidental duties imposed by statute. But their primary duty is to attend to the repair and good order of the fabric of the church. The common law requires that there should be two churchwardens, one of whom is appointed by the incumbent, and the other is chosen by the parishioners in vestry assembled, but sometimes this rule is varied by a local custom. This appointment and election takes place in Easter-week of each year. In electing the people's churchwarden, there is often much local excitement, and it is common to poll the parish, all those who pay poor-rates being entitled to vote, the number of votes varying according to the rent, but no person having more than six votes. See CHURCHWARDENS; CHURCH RATES.

The next most important business connected with the parish is that which concerns the poor, the leading principle being, that each union is bound to pay the expense of relieving its own poor. See OVERSEERS; GUARDIAN; POOR.

Another important feature of the parish is, that all the highways within the parish

must be kept in repair by the parish, i.e., by the inhabitants who are rated to the poor. For this purpose, the inhabitants of each parish, in vestry assembled, appoint each year a surveyor of highways, whose duty it is to see that the highways are kept in good repair; and he is authorized, by the general highway act, to levy a rate on all the property within the parish. The office of a surveyor of highways is, like those of churchwarden, overseer, and guardian, a compulsory and gratuitous office. When a highway is out of repair, the mode of enforcing the repair is by summoning the surveyor of highways before justices, to show cause why he has not repaired the road; and if the facts are not disputed, the justices either fine him, or order an indictment to be laid against the inhabitants of the parish. This indictment is tried, and the expense of it is defrayed out of the highway-rate, which is subsequently made. The highways of each parish being thus exclusively under the control of the ratepayers and their officers, it happened that great inequality prevailed in the standard of repairs which each parish set up for itself. This led to the late highway district acts, first passed in 1862, the object of which is to enable the justices of the peace of the district to combine several parishes into one district, and thus secure more uniformity in the repairs of the highways. A way-warden is now appointed to represent each parish at the highway board, instead of the old highway surveyor; but the expenses of maintaining the highways are still ultimately paid by the parish in which they are situated, the only change being, that the expenses are ordered to be incurred by the highway board, instead of the parochial officer.

The above duties in reference to the parish church, the poor, and the highways, are the leading duties attaching to the parish as a parish; but over and above these, many miscellaneous duties have been imposed on the parish officers, particularly on the overseers and churchwardens, which will be found specified under the head of Overseers. In nearly all cases where the parish, as a parish, is required to act, the mode in which it does so is by the machinery of a vestry. A vestry is a meeting of all the inhabitant householders rated to the poor. It is called by the churchwardens, and all questions are put to the vote. Any ratepayer who thinks the majority of those present do not represent the majority of the whole parishoners, is entitled to demand a poll. At these meetings, great excitement often prevails, especially when there existed church-rates. Wherever a parish improvement is found to be desirable, the vestry may meet and decide whether it is to be proceeded with, in which case they have powers of rating themselves for the expense. Such is the case as to the establishment of baths and wash-houses, watching, and lighting. Returns are made of all parish and local rates to parliament every year. The parish property, except the goods of the parish church, which are vested in the churchwardens, is vested in the overseers, who hold and manage the same, requiring the consent of the poor-law board in order to sell it. Of late, a statute has authorized benefactors to dedicate greens or playgrounds to the inhabitants of parishes, through the intervention of trustees.

In Scotland the division into parishes has existed from the most ancient times, and is recognized for certain civil purposes relative to taxation and otherwise, as well as for purposes purely ecclesiastical. The court of session, acting as the commission of teinds, may unite two or more parishes into one; or may divide a parish, or disjoin part of it, with consent of the heritors (or landholders) of a major part of the valuation; or apart from their consent, if it be shown that there is within the disjoined part a sufficient place of worship, and if the titulars of teinds, or others who have to pay no less than three-fourths of the additional stipend, do not object. By act 7 and 8 Vict. c. 44, any district where there is an endowed church may be erected into a parish *quoad sacra*, for such purposes as are purely ecclesiastical. Endowed Gaelic congregations in the large towns of the Lowlands may similarly be erected into parishes *quoad sacra*.

The principal application of the parochial division for civil purposes relates to the administration of the poor-law. Under the old system the administrators of the poor-law were the kirk-session in county parishes, and the magistrates, or certain managers selected by them, in burghal parishes. The act 8 and 9 Vict. c. 83, which remodeled the poor-law of Scotland, retained the old administrative body so long as there was no assessment; but, on a parish being assessed, substituted for it a new one, consisting in rural parishes of the owners of heritable property of £20 yearly value, of the magistrates of any royal burgh within the bounds, of the kirk-session, a certain number of members chosen by the persons assessed; and in burghal parishes of members, not exceeding 30, chosen by the persons assessed, four members named by the magistrates, and not above four by the kirk-session or sessions. The board of supervision may unite two or more parishes into a combination for poor-law purposes. There is not the same extensive machinery for parochial self-government that exists in England. The burden of supporting the fabric of the church falls on the heritors, and there are no churchwardens. Highways are not repairable by the parish, and there are no elections of surveyors or way-wardens. The meeting of the inhabitants in vestry, which so often takes place in England, is unknown in Scotland, and hence the ratepayers do not interest themselves so much in local affairs. Many of the duties which in England are discharged by parochial officers, are in Scotland discharged by the sheriff-clerk, a county-officer. The system of having a parish school (q.v,) in every parish (a system extended by the education act of 1872) has long prevailed in Scotland, though unknown in England till the year 1870.

The word parish has in this country a usage different from that in England; and its usage is not the same in all the states. In Louisiana it is synonymous with county in the other states. The legal significance of the English parish arises from the right of the rector to receive tithes of the agricultural products of the parish. In America no such right ever existed. But from the first settlement of the country, associations were formed or corporations organized for religious worship; and parish denoted the territorial limit of a church. In New England, where the connection between church and state was originally very close, and where at one time only church members were qualified to vote, the parish was the town; that is, the whole body of qualified citizens, acting as the town in civil matters, constituted and acted as the parish in ecclesiastical matters. The same town-meeting, for instance, would vote an appropriation for the roads of the town, and another appropriation for the salary of the pastor of the town church. There was originally but one church and one parish in each town; but as population increased new parishes were set off, still remaining territorial divisions for ecclesiastical purposes. Finally, as Congregationalism ceased to be the sole form of religion in New England, and new denominations sprang up, and new churches were organized, the theocratic idea died, and it was recognized that all denominations should be on an equality. The state and the town as such ceased to provide for the support of religious worship, and parish henceforth denoted a voluntary association of persons with the same religious worship, without reference to locality or residence.

PARISH, Elijah, d.d., 1762–1825; b. Conn.; graduated at Dartmouth, 1785; studied theology with the Rev. Ephraim Judson of Taunton, Mass., and in 1787 was settled as pastor of the Congregational church at Byfield, Mass.; remaining there till his death. His theological views were those of Dr. Hopkins. He was greatly interested in politics, and in the annual election sermon which he preached in 1810 he censured so severely the policy of the government that the legislature refused to publish it. It had however a wide circulation. He published with Dr. Morse, *A Gazetteer of the Eastern and Western Continent;* also *A History of New England; System of Modern Geography; Memoir of Dr. Eleazar Wheelock,* first president of Dartmouth college; *Sacred Geography, or Gazetteer of the Bible.* In 1826 a volume of his *Sermons* was published with a memoir.

PARISH CLERK, in England, is an officer of the parish of some importance, his duty being to lead the responses during the reading of the service in the parish church. He is appointed by the parson, unless some other custom of a peculiar kind exists in the parish. He must be 20 years of age, and has his office for life, but is removable by the parson for sufficient cause. By the statute 7 and 8 Vict. c. 59, a person in holy orders may be elected a parish clerk. Under some of the church-building acts governing the new churches built in populous parishes, he is annually appointed by the minister. The salary of the parish clerk is paid out of the church-rate.

PARISH SCHOOL. In England, prior to the recent education act, there was no such thing as a parish school—that is, a school existing for the benefit of the parishioners, endowed by the state, or supported by taxes on the parishioners. Every school beyond charity schools was more or less voluntary in its character, and endowed, if at all, by private benefactors. In Scotland, however, it was essential that in every parish there should be a parish school, for a statute of 1696 made it compulsory on the heritors—i.e., the chief proprietors—to provide a school-house, and to fix a salary for the teacher. If the heritors neglected to supply a school-house, the presbytery was empowered to order one at the expense of the heritors. The schoolmaster's salary was fixed according to a certain proportion, half of the rate or cess being paid by the landlord, and half by the tenant. In 1803 a statute was passed to regulate the salaries, and to give a right to the schoolmaster to have a house and garden. The office was further regulated by a later act, 24 and 25 Vict. c. 107. The salary was fixed to be from £35 to £70 per annum, to be varied and fixed by the heritors and minister of the parish, in the case of future vacancies. The qualification of the schoolmaster consisted in passing an examination conducted by the examiners of parochial schoolmasters, who were professors of the universities, who made regulations as to the time and mode of examination. For this purpose, Scotland was divided into 4 districts, each in connection with one of the Scotch universities. When examined, the person obtained a certificate of fitness from these examiners. The schoolmaster, who had formerly, before admission to office, been required to sign the confession of faith and the formula of the church of Scotland, and to profess that he would submit to its government and discipline, had by this act merely to make a declaration that he would not, in his office, endeavor, directly or indirectly, to teach or inculcate opinions opposed to the divine authority of the holy Scriptures, or to the doctrines contained in the shorter catechism, agreed upon by the assembly of divines at Westminster, and approved by the general assembly of the church of Scotland, and that he would not exercise the functions of his office to the prejudice or subversion of the church of Scotland as by law established. In case of misconduct, the presbytery might complain to the secretary of state, who would institute a commission to inquire and report, and to censure, suspend, or deprive such schoolmaster accordingly. The sheriff of the county was made the sole judge of charges of immorality, or cruel or improper treatment of the scholars, offenses formerly cognizable by the presbytery; and the heritors and minister might permit or require him to resign, and allow him a retiring

allowance. Notwithstanding all these improvements, however, it continued to be apparent that the system of parish schools, however well adapted to Scotland at the revolution, had fallen behind the requirements of the country when the population had tripled, and large manufacturing villages and towns had sprung up in rural districts. But for denominational and other schools, vast numbers of children would have been left without the rudiments of education. By the education (Scotland) act, 35 and 37 Vict. c. 62 (1872), the parish schools were placed under the management of the school board of each parish, the jurisdiction of heritors, ministers, and church courts was abolished, and every school under the management of the school board was declared to be equally a parish school.

PARISIENNE, LA, French revolutionary song, supposed to have been written in 1757, at the time of the siege of Harfleur. The words were by Casimir Delavigne, the music by Brack. The latter was transposed by Auber, who composed additional bars of instrumental accompaniment. The subject is the triumph of the Orleanist party, and the air is bold and martial. It was first sung in public at the Théâtre Porte Saint-Martin, Paris, Aug. 2, 1830, and at the Académie Royale de Musique, Aug. 4, 1830, by Adolphe Nourrit, who sang it every evening for several months.

PARIS, Plaster of. See Gypsum.

PARK (Fr. *parc*), a term still employed in some parts of Britain, in its original sense, to denote a field or inclosure, but more generally applied to the inclosed grounds around a mansion, designated in Scotland by another term of French origin, *policy*. The park, in this sense, includes not only the lawn, but all that is devoted to the growth of timber, pasturage for deer, sheep, cattle, etc., in connection with the mansion, wherever pleasure-walks or drives extend, or the purpose of enjoyment prevails over that of economical use. *Public parks* are those in the vicinity of towns and cities, open to the public, and intended for their benefit. An increase of public parks is a pleasing feature of the present age, and not a few towns enjoy parks recently bestowed by wealthy persons somehow connected with them. A decorated half-acre of trees and flowers in Montreal is called a park, with the same propriety as the deer park of hundreds of acres; and with more correctness than when those vast extents of natural meadows flecked with trees in Colorado are called parks. The evident needlessness of shutting people out of the enjoyment of nature's beauties which their use will not harm, has long made the great parks of England and the continent almost as free to the people as recognized "commons." A grassy expanse, large or small, stocked with shade trees, and used for rest and recreation, is a park; whether it be as formal as Versailles, as wild and picturesque as Fontainebleau, or as trim as an old Dutch garden. Even grass may be omitted, and yet the park remain. The park of the Tuileries in Paris is so swarmed with people that no grass could be maintained under the trees without limiting to an intolerable degree its use. The entire surface among its trees not occupied by pavements, groups of shrubs, or parterres of flowers, is covered with loose gravel, through which water percolates to the tree roots, and over which there is no restraint of popular use. The beauty of the park is lessened, but its value greatly increased for the use intended—viz., the recreation of the greatest number of people. The distinction between a park and a pleasure garden is this: the decorated garden where no crop is grown is cultivated to exhibit a growth of grass, trees, shrubs, or flowers with reference to the special beauty of each, as well as the beauty of harmonious arrangement. The perfectness of development of each part of a pleasure garden is the object aimed at. The garden becomes a park whenever freely used for recreation by persons not interested in its special growth. It is the tendency of our modern suburban home gardening to make playgrounds of their grassy surroundings, where croquet and all out-door family sports may be freely indulged. Thus they become our little parks, rather than gardens. Frederick Law Olmsted, the highest American authority on parks, suggests that little open spaces in cities, designed for public use, should be called *places*, when not large enough to have grass and trees; and *place-parks* when barely large enough to have grass plats and a few trees; that thoroughfares planted with trees for special adaptation to promenades or as avenues to parks, should be called *park-ways*; and public forests without roads simply *woods*. The Spanish have a word to designate long walks under avenues of trees which are neither thoroughfares nor park-ways, and yet admirably adapted to small cities, viz., *alameda*. The main streets of many old American towns arched with elms or maples, are some of the finest examples of alamedas, or park-ways, if the country beyond them might be considered park.

Public parks in the United States on a small scale are as old as their cities. A seaside walk was originally the most common. The Battery in New York, and the Bay Side in Charleston, S. C., are familiar examples. The City Hall Park in New York was originally its men's and boys' playground or common. It was but little improved until the city hall was built, when it was offensively fenced in. Boston common was specifically dedicated to public use by the founders of the city, and has more perfectly fulfilled its use than any other equal area in the country. Public squares in nearly all the cities, notably around Yale college in New Haven, have shown the noble expression that may be given to a very limited park by avenues of full grown native trees. The period of land speculation from 1830 to 1837, when great numbers of western cities were planted, was peculiarly unfortunate in the failure to dedicate ground liberally either in

park-places, public squares, or larger grounds. The beginning of the era of public parks for large cities, commensurate with their size, was when the city of New York felt the lack of park provision for her people and secured special legislation to create the Central Park. Though inferior in many respects to older parks, especially if its recent growth of trees be compared with noble old park forests, and its limited ranges of lawn with the great expanses of the finest English parks, yet it has this merit in a remarkable degree: that, in proportion to the ground which it covers, the loss of space by the great reservoir being considered as well as its proportions and topography, it has developed more beauties and interest for public use than any other. The property was secured in 1857, and the plans for its laying out submitted by Frederick Law Olmsted and Calvert Vaux were adopted and put in their charge to be executed. Work was begun at once. In 1858 4,000 men were engaged on it. The orderly manner in which the people thronged to enjoy its first opening beauties was a pleasing refutation of the fear that had been expressed that a quiet enjoyment of a park could not be maintained in an American city. The ground as purchased was a region of ledgy granite hills and swampy hollows, embracing a few small farms and old mansions. The transformation within five years was marvelous, and an enduring monument of the genius of the designers, their executive ability, and the energetic spirit of the park commissioners. The ground occupied is 2½ m. long n. and s. and a half-mile wide e. and w. The city reservoirs within it occupy 142 acres, forming a lake the elevation of which does not permit it to be given the air of a natural piece of water, but which nevertheless is a pleasing feature in the warm months. Besides this water there are six beautifully managed artificial lakes, containing in all 43 acres. Exclusive of the reservoirs and building sites, the park contains 683 acres. About 110 acres are in lawn, little broken by rocks and only bordered by trees, and the remainder mostly broken ground, in glades and young forests, or covered with copses and shrubbery, but nearly all in a condition to have a surface of lawn. There are 9½ m. of carriage roads of admirable construction, 5½ m. devoted to saddle-horse use; and 28 m. of walks. The average breadth of the drives is 50 ft., of walks 13 ft.; and the entire area occupied by roads and walks is 100 acres. There are 8 bridges over water and 38 for roads and walks that intersect at different levels; forming altogether the most varied study of single-arched bridge designs to be found within the limits of a single park. In the originality of the forms employed in these bridges (no two of them being alike or even similar) in the grace of their lines, their adaptation to abutting grounds, the happy use of all sorts of materials, of cut stones, and rustic, of mixed stone and brick, of iron and wood in their construction, in the perfectness of the mechanical work and the delicate taste of their details they are monuments of the genius and taste of Mr. Calvert Vaux the architect, unsurpassed, if equaled, anywhere. The grand terrace, also by Mr. Vaux, is the first great work of park architecture executed in the United States. It is an admirable study. The visitors to the park frequently exceed 100,000 a day. A magnificent system of parks and drives has been projected for the part of the island above Central Park. Prospect Park, Brooklyn, is an outgrowth of the enthusiasm developed by the creation of the Central Park. It contains 550 acres, all of which is available for park use. Well-grown trees already on a part of it, and larger stretches of grassy ground, gave a nobler immediate effect in sylvan features than was possible in Central Park. Its architectural features, though on a grand scale, are not so interesting as those of Central Park, except at the entrance, which is finer. The park was designed by the same gentlemen who created Central Park, with masterly skill in producing the finest results with the means at hand. The heights command a fine view of New York bay and the ocean. Artificial lakes covering 50 acres of its surface are supplied with water by steam-power. It has 10 m. of carriage drives, 4 m. of saddle-horse roads, and 11 m. of walks. New York and Brooklyn together have about 1600 acres appropriated to parks.

Philadelphia, in addition to her generous original squares for park use—as Franklin, Washington, Independence, Logan, and Rittenhouse—has followed and outdone New York in the purchase and improvement of 2740 acres in one body—Fairmount Park. Its extent, varied surface, fine old trees, broad expanses of turf, the Schuylkill river at its side, and the stream of the Wissahickon, flowing through a picturesque rocky valley clothed with the trees, shrubs and wild vines of virgin nature, through dark dells, broken by numerous waterfalls, altogether give it a different character from that of most other parks of the United States. In artificial improvements it has had less expended upon it than the New York and Brooklyn parks. Baltimore has the honor of the noblest forest park of the United States, Druid Hill—an old forest of 700 acres acquired in 1860, previously the private park of an old estate.

Boston's common contains 48 acres of pleasantly varied surface. English elms forming a part of its exterior avenues are the finest of their kind in the United States. The "public garden" is an extension n.w. of the common containing 21¼ acres, separated from it by a street. It is kept in gardenesque style as an arboretum and botanical garden, and contains a small lake, a conservatory, and many fine statues. The city has 38 smaller parks. Commonwealth Avenue, leading n.w. from the public garden, is a grand park-way, 1½ m. long, 240 ft. wide, in the center of which are double avenues of trees, and walks through grass-plots, shrubbery, and flowers. New Haven, Conn., has a park of 350 acres, including East Rock, 360 ft. high.

The park system of Chicago, devised after 1864, was extensive and thorough as a plan, and though not yet completely carrried out, already fulfills an important mission of pleasure and comfort to its citizens. The plan embraces 1900 acres divided between 6 parks of 250 acres each and the broad park-ways which connect them, and form a circumvallation of the city from lake Michigan n. round to the lake south. The parks by the lake-shore have some features that were suggested by peculiarities of Venice, and in the hot summer months are delightful. The parks on the flat prairies west of the city will be slow to develop the beauty that can come only from a growth of trees to shade their lawns and walks. The park-ways are 20 m. in length, 200 to 250 ft. wide.

St. Louis has 2,100 acres devoted to park use, of which 100 acres are small place-parks, already in use in the city. Tower Grove Park, containing 277 acres, has been handsomely improved, and is connected with the city by a park-way 120 ft. wide, which is a part of 12 m. of such avenue embraced in its park system. Cincinnati has over 400 acres of park. Eden park, containing 216 acres, lies on the bluffs of the Ohio river e. of the city, and has a pleasing variety of vale and hill beautifully kept. Burnet-wood contains 170 acres mostly forest. Buffalo has one of the best park systems in the United States, consisting of a park of 350 acres of a rural character, with fine trees, a lake of 46 acres approached from the city by a noble avenue with park-ways 200 ft. wide, and a promenade along its shore on one side, and a parade-ground and garden on the opposite side. The park and park-ways together cover 530 acres. San Francisco has made an interesting essay in park-making by the conversion of some of the shifting sand dunes w. of the city into parks, by a careful system of watering and seeding; so that places where the sweep of winds from the Pacific made and unmade new sand hills or materially changed all their surfaces every year, have become well-established lawns, planted with trees, and in a fair way to become beautiful parks. The work has not been so systematically followed up as was intended, but whenever it is, then gardening skill, seconded by the peculiarly moist and equable climate of that coast, may be relied upon to cover the parks with interesting forms of semi-tropical vegetation. Winds are the sole enemy to these park formations; 1000 acres have been devoted to this experiment in the Golden Gate Park, and broad park-ways along the sea entrance to the bay lead to it. Smaller cities throughout the United States and Canada have of late years followed the lead of the great ones. In many of them, comparatively small areas near the centers of population serve better than larger ones remote from it. It is a misfortune in many American cities that the late awakening to the need of more pleasure-grounds has forced the purchase of lands too remote to be most useful to the body of poor people who have most need of their pure air and priceless recreation; and it is too much the fashion of modern park-making to provide for those who can drive or ride to them, rather than for those who, like women and children, will use them only when near. In this respect European cities are generally much more favored. There nearly every town formerly had its wall and surrounding ditches and reserve of open ground outside kept clear for military defense, all belonging to the state. These walls and adjacent grounds, before as well as after the fortifications were razed, were the promenades of the people, and in modern times have been converted into parks and boulevards. Towns which have grown greatly have had several successive circles of inclosing fortifications, thus providing, as in Paris and Vienna, several successive circles of public promenades, boulevards, and commons. Parks could not be devised more convenient to the people than these environing grounds nearly equi-distant to all the population.

The area of parks in London, England, is proportioned to the immensity of the city. Only a small part of them are broken by carriage roads; nearly their whole extent being dedicated to the exclusive use of pedestrians. Its seven great parks are: Hyde, containing about 400 acres, intersected by walks and carriage roads, (including the famous saddle-horse drive called Rotten Row) clothed with old forests, and graced by the lake called Serpentine; Kensington Gardens, and adjoining royal park of about the same size, further from the city; Green, a smaller pedestrian park, by which Hyde Park may be approached; Regent's nearly circular, with 450 acres, and having zoological and botanic gardens; Victoria Park, with 290 acres, Battersea Park, 320 acres, Kensington Park, 20 acres, are almost exclusively for pedestrians; as well as the great Botanic Gardens of Kew outside of London. Paris is more noted for the elegance and great number of its place-parks and avenues for promenades than for real parks. The latter have become numerous of late years, and are even more recent than the Central Park of New York. The Bois de Boulogne, an ancient wood belonging to the crown, was given to the public about 1852. It contains 2,250 acres, not particularly interesting by nature, with no noble trees, but treated with all the graces of art possible to cover its natural deficiencies. Carriage drives and promenades traverse it in every part, and four artificial lakes are its most interesting feature. The most striking new park in the city is the Buttes Chaumont in the n.e. quarter, occupying the site of extensive old stone quarries. It embraces 62 acres, and is picturesque to a degree that renders it peculiarly charming and surprising in the midst of the city on the unsightly place of the exhausted quarry. It is probably the highest triumph of modern taste and skill in park creation. The Park Monceau is a smaller example of similar skill. The old gardens of the Tuileries already alluded to, and the somewhat similar gardens of the Luxembourg, though more like gardens than parks in their treatment, are so completely

used by the public that they fulfill all the uses of parks. Paris is provided with park resorts outside of the city to a greater extent than any other city. All the old chateau forests and hunting grounds of successive kings of France are now the property of the state, and furnish attractions in every direction out of the city. St. Cloud, Versailles, Vincennes, Fontainebleau, the latter one of the most picturesque and extensive of old royal hunting forests, are the most noted. Smaller cities in France and throughout Europe abound in beautiful small parks contiguous to their population, most of which have been improvements of the last 30 years, made possible by the possession by municipalities of suitable ground previously used by the public, but not specially improved for their enjoyment.

Private parks of much extent are everywhere decreasing rather than increasing, especially in the United States. The ambition for family land estates after the manner of the English was once general among the wealthy. The inheritors of estates under colonial grants, like the Livingstons and Van Renssellaers on the Hudson, formerly maintained private parks of great beauty. But the care and expense of maintaining a large and hospitable establishment, the loneliness of the mansion occupants without such tax for hospitality, and the weight of taxes concentrated on lands, have tended of late years to the abandonment of the park establishments and the sale and subdivision of such properties. In short, it is the tendency of civilization to make public parks instead of private ones.

PARK, a co. in central Colorado, drained by branches of the Platte river, which has its sources in the co.; 2100 sq.m.; pop. '90, 35,048, chiefly of American birth. The surface is mostly table-land, bounded on the n. and w. by the Park range of the Rocky mountains. The scenery is remarkable for its beauty and sublimity. The soil is good grazing land, and oats, potatoes, and barley are the chief products. Gold, silver, copper, and lead abound. Co. seat, Fair Play.

PARK, Edwards Amasa, d.d , ll.d., born Providence, R. I., 1808; graduated at Brown university, 1826; and at Andover theological seminary, 1831; ordained the same year pastor of the Congregational church in Braintree, Mass.; elected in 1835 professor of moral and intellectual philosophy in Amherst college; in 1836 became Bartlett professor of sacred rhetoric in Andover theological seminary; and in 1847 Abbot professor of Christian theology in the same institution, retiring as emeritus professor in 1881. He contributed largely to periodicals, and he was one of the editors of the *Bibliotheca Sacra* from the beginning. With Prof. B. B. Edwards he translated a volume of *German Selections;* edited the *Writings of Rev. William Bradford Homer,* with a memoir; a volume on homiletics, the *Preacher and Pastor,* with an introductory essay; *The Writings of Prof. B. B. Edwards,* with a memoir, 2 vols.; and jointly with Drs. Austin Phelps and Lowell Mason, the *Sabbath Hymn and Tune Book.* In 1859 he assisted in the preparation of a volume of *Discourses and Treatises on the Atonement,* and wrote an introductory treatise on *The Rise of the Edwardean Theory of the Atonement.* With Dr. Phelps and the Rev. D. L. Furber he published in 1861 a volume entitled *Hymns and Choirs.* He has written memoirs of Drs. Hopkins and Emmons for the editions of their works. He has published several sermons, one of which, a "convention sermon," on *The Theology of the Intellect and the Feelings,* occasioned a theological controversy between him and Prof. Hodge of Princeton. Dr. Park was long considered one of the leading pulpit orators of the country, as regards both the matter of his discourse and the combined vigor and finish of his delivery. His use of words was exceedingly accurate and felicitous, and his illustrations were singularly apt. For many years he was the foremost expounder of what is known as the New England theology, a strongly evangelical scheme of Christian doctrine, which has doubtless had a modifying power on the intenser forms of Calvinism, long prevalent in the middle and southern states. As editor of a leading theological quarterly, high in repute on both sides of the Atlantic, Dr. Park exerted wide influence. But as a lecturer to consecutive classes of students for the ministry he exerted an intellectual force keen, profound, vital, and formative, whose range and value can scarcely be overestimated. He closely devoted himself to this work, visiting Europe for study and for indispensable rest, but seldom leaving his classes for any more public sphere. In 1883 he published a pamphlet entitled *The Associate Creed of Andover Theological Seminary,* and in 1885 the volume, *Discourses on Some Theological Doctrines as Related to the Religious Character.*

PARK, Mungo, a celebrated African traveler, was the son of a Scottish farmer, and was b. Sept. 10, 1771, at Fowlshiels, near Selkirk. He studied medicine in Edinburgh, and afterward went to London, where he obtained the situation of assistant-surgeon in a vessel bound for the East Indies. When he returned, in 1793, the *African Association* of London had received intelligence of the death of maj. Houghton, who had undertaken a journey to Africa at their expense. Park offered himself for a similar undertaking, was accepted, and sailed from England May 22, 1795. He spent some months at the English factory of Pisania, on the Gambia, in making preparations for his further travels, and in learning the Mandingo language. Leaving Pisania on Dec. 2, he traveled eastward; but when he had nearly reached the place where Houghton lost his life, he fell into the hands of a Moorish king, who imprisoned him, and treated him so roughly that Park seized an opportunity of escaping (July 1, 1796). In the third week of his flight he reached the Niger, the great object of his search, at Sego (in the kingdom of Bambarra), and followed

its course downward as far as Silla; but meeting with hindrances that compelled him to retrace his steps, he pursued his way westward along its banks to Bammakoe, and then crossed a mountainous country till he came to Kamalia, in the kingdom of Mandingo (Sept. 14), where he was taken ill, and lay for seven months. A slave-trader at last conveyed him again to the English factory on the Gambia, where he arrived June 10, 1797, after an absence of nineteen months. He published an account of his travels, after his return to Britain, under the title of *Travels in the Interior of Africa* (Lond. 1799), a work which at once acquired a high popularity. He now married and settled as a surgeon at Peebles, where, however, he did not acquire an extensive practice; so that, in 1805, he undertook another journey to Africa at the expense of the government. When he started from Pisania, he had a company of 45, of whom 36 were European soldiers; but, when he reached the Niger, in August, his attendants were reduced to 7, so fatal is the rainy season in those regions to Europeans. From Sansanding, on the Niger, in the kingdom of Bambarra, he sent back his journals and letters in Nov., 1805, to Gambia; and built a boat, in which he embarked with four European companions, and reached the kingdom of Houssa, where he and they are believed to have been murdered by the natives, or drowned as they attempted to sail through a narrow channel of the river. The fragments of information and other evidence picked up among the natives by Clapperton and Lander (q.v.), strongly confirm this view of the fate of Park and his companions. An account of Park's second journey was published at London in 1815. Park's narratives are of no inconsiderable value, particularly for the light which they throw upon the social and domestic life of the negroes, and on the botany and meteorology of the regions through which he passed; but he was unfortunately cut off before he had determined the grand object of his explorations—the discovery of the course of the Niger.

PARK, Roswell, d.d., 1807–1869; b. Conn.; graduated at Union college, and at West Point in 1831, and was lieut. of engineers at the latter place until 1836; was professor of natural philosophy and chemistry in the university of Pennsylvania, 1836–42; ordained a minister in the Protestant Episcopal church in 1843; was principal of Christ Church Hall, Conn., 1846–52; president of Racine college, Wis., 1852–59; chancellor of the college, 1859–63. In 1863 he founded at Chicago a literary and scientific school, Immanuel hall, of which he was rector and proprietor till his death. He is the author of *Selections of Juvenile and Miscellaneous Poems; Pantology, or Systematic Survey of Human Knowledge; Sketch of the History of West Point; Hand-book for American Travelers in Europe; Jerusalem and other Poems;* and some lectures and addresses.

PARK of **ARTILLERY** is the whole train of great guns with equipment, ammunition, horses, and gunners for an army in the field. It is placed in a situation whence rapid access can be had to the line of the army in any part; and at the same time where the divisions of the force can easily mass for its protection. The horses of the park are picketed in lines in its rear.

PARKA, the name given by Fleming to a fossil from the old red sandstone, about which there has been considerable difference of opinion. The quarrymen call them "berries," from their resemblance to a compressed raspberry. They were compared by Fleming to the panicles of a Juncus, or the globose head of a sparganium. Lyell thinks they resemble the egg-cases of a natica, while Mantell suggested that they were the eggs of a batrachian. The opinion now most generally entertained is that they are the eggs of the pterygotus.

PARKE, a co. in w. Indiana, having the Wabash river for its w. boundary, intersected by the Terre Haute and Indianapolis, and the Chicago and Eastern Illinois railroads; 440 sq. m.; pop. '90, 20,296, chiefly of American birth, with colored. It is drained by Sugar and Raccoon creeks, branches of the Wabash. Its surface is generally level, elevated in some portions, and largely covered with forests of hardwood timber, interspersed with groves of sugar maple and ash. Its soil is fertile, producing wheat, corn, dairy products, and vegetables. Cattle, sheep, and swine are raised. A mineral product is bituminous coal, called block coal. Its leading industries are the manufacture of carriages and wagons, saddlery and harness, woolen goods, and cooperage. Co. seat, Rockville.

PARKE, John, b. Del., 1754; a student at the university of Pennsylvania in 1768. At the beginning of the revolution he was assistant quartermaster-gen., and as some of his poems are dated in camp at Valley Forge and near Boston, it is probable that he was in Washington's division. At the close of the war he went to Philadelphia, and in 1786 published *The Lyric Works of Horace, translated into English Verse, to which are added a number of Original Poems by a Native of America.* He d. 1783.

PARKE, John Grubb, b. Penn., 1827; after graduating at West Point in 1849, he was commissioned 2d lieut. in the topographical engineers, and became 1st lieut. in 1856. From 1857 till the civil war he acted as chief surveyor and astronomer in locating the n.w. boundary. In 1861 he received the rank of brig.-gen. of volunteers, and in Burnside's North Carolina expedition commanded a brigade at Roanoke island and Newbern, and was first in command at the capture of fort Macon. For his services in these engagements he was promoted to the rank of maj.-gen., and at Antietam and South Mountain was chief of staff of the 9th corps. When Gen. Burnside assumed command of the army

of the Potomac, Gen. Parke was appointed his chief of staff, and was present at the battle of Fredericksburg and the siege of Vicksburg. At Jackson he commanded Sherman's left wing, and subsequently took part in the siege of Petersburg and the Richmond campaign. He showed great gallantry in the defense of Knoxville and at fort Steedman. Gen. Parke was promoted to colonel of engineers, 1884; appointed superintendent of the U. S. military academy, 1887; and was retired, 1889.

PARKER, a co. in n. Texas, intersected in the s e. by the Brazos river; 900 sq.m.; pop. '90, 21,682, chiefly of American birth, with colored. Its surface is rolling, composed of broad prairies, well timbered for that section of the country. It is drained by rivulets from the Brazos river, and has a fertile soil adapted to the production of cotton, corn, fruit, and vegetables. Live stock is raised to some extent, and coal is found. Co. seat, Weatherford.

PARKER, a family of distinction in the annals of the British navy. The founder of the family was sir HUGH PARKER, an alderman of London, who received a baronetcy in 1681.—His grand-nephew, sir HYDE PARKER, commanded the British fleet in the action off the Dogger bank, Aug. 5, 1781, in which three Dutch ships were destroyed, and the rest of the Dutch fleet compelled to retreat into harbor. In 1783 he was appointed to the command of the British fleet in the East Indies; but the ship in which he sailed thither was lost, with all on board.—His second son, sir HYDE PARKER, distinguished himself in the American war; blockaded the Dutch harbors with a small squadron in 1782; commanded the British fleet in the West Indies in 1795; and in 1801 was appointed to the chief command of the fleet which was sent to the Baltic to act against the armed coalition of the three northern states of Russia, Sweden, and Denmark. He had no share in the battle of Copenhagen, in which Nelson engaged contrary to his orders; but by his appearance before Carlscrona, he compelled the neutrality of Sweden; and he was on the point of sailing for Cronstadt when the news of Paul's death put an end to hostilities.—His kinsman, sir WILLIAM PARKER, was also a British admiral of high repute for his skill and bravery, and contributed to some of the great victories of the close of last century.—Sir PETER PARKER, who was born in 1721, and died in 1811, with the rank of admiral of the fleet, served with distinction during the seven years' and the American wars; and in 1782 brought the French admiral, De Grasse, a prisoner to England, for which he received a baronetcy.—Sir WILLIAM PARKER, born in 1781, commanded the frigate *Amazon* in 1806, and took, after a hard battle, the French frigate *La Belle Poule*, belonging to the squadron of Admiral Linois; and in 1809 captured the citadel of Ferrol. In 1841 he succeeded to admiral Elliot in the command of the fleet in the Chinese seas during the first Chinese war. He took possession of Chusan, Ningpo, and Shapu; forced the entrance of the Yang-tse-kiang; and arrived under the walls of Nankin, where the treaty of peace was agreed upon. For these services he received a baronetcy in 1844. He was afterwards appointed to the command of the fleet in the Mediterranean, and exerted himself, although in vain, to mediate between the Neapolitan government and the insurgent Sicilians. In autumn, 1849, he sailed to the Dardanelles, at the request of sir Stratford Canning (now lord Stratford de Redcliffe), to support the Porte against the threatening demands of Austria and Russia concerning political fugitives; and in Jan., 1850, he compelled the Greek government, by a blockade of their ports, to comply with the demands of Britain. Named in 1851 admiral of the blue, he resigned the command of the Mediterranean fleet to Admiral Dundas, was created admiral of the white in 1853, admiral of the red in 1858, and rear-admiral of the United Kingdom in 1862. He died in 1866.

PARKER, AMASA JUNIUS, LL.D., b. Conn., 1807; graduated at Union college in 1825. He was principal of the Hudson academy in 1823, studied law, and was admitted to the bar in 1828, when he entered into partnership with a relative at Delhi, N. Y. He was elected to the state legislature in 1833, and two years later was made a regent of the state university. In 1837 he was elected a member of congress, became a circuit judge, and vice-chancellor of the court of equity in 1844; and a supreme court judge shortly afterwards. He was a founder of the Albany law school, and for many years one of its professors. He compiled *Reports of Criminal Cases*, 6 vols. 8vo, 1855–69; and with Wolfert and Wade, *The Revised Statutes of New York*, 3 vols. 8vo, 1859. He d. in 1890.

PARKER, CORTLANDT, LL.D., b. Perth Amboy, N. J., 1818; graduated at Rutgers coll., 1836; was admitted to the bar 1839, where he has since been prominent. He was one of the commissioners to settle the boundary line between N. J. and Del,, and was one of the revisers of the N. J. laws, 1874–75. Without being active in politics, he was a firm republican, and was nominated by Pres. Hayes as minister to Russia, and by Pres. Arthur as minister to Austria, both of which positions he declined. He was prominent also as a legislator in the general conventions of the Protestant Episcopal church, and as a corporation counsel.

PARKER, EDWIN POND, b. Me., 1836; graduated at Bowdoin college in 1856; became pastor of the South Congregational church, Hartford, Conn., in 1860, where he remains. He has fine poetic taste and musical culture, and has done excellent work in compiling books of hymns and tunes for church service.

PARKER, FOXHALL ALEXANDER, 1821–79; b. N. Y.; son of capt. F. A. Parker, U. S. navy; educated at the naval academy, and received his appointment as midshipman in

1843. He served in the Indian campaigns in Florida, was commissioned lieut. in 1850, and during the rebellion commanded the gun-boat *Mahaska*, had charge of the naval battery on Morris island, which reduced fort Sumpter to a mass of ruins, and in 1864 had command of the Potomac flotilla. The rank of commander was bestowed on him in 1862, and that of capt. in 1866. He was the author of several magazine articles, and of two books, *Squadron Tactics under Steam;* and *Naval Howitzer Ashore and Afloat.* In 1873 he was appointed chief signal officer of the navy.

PARKER, Gilbert, author and dramatist; b. in Quebec, Canada, in 1862. He was educated for the ministry; became lecturer on English literature at Trinity college, Toronto; made a combined lecturing and pleasure tour of the South Sea islands, Australia, Ceylon, Java, Fiji, and the Sandwich islands; and then settled in London, England, where he made an immediate success with his fiction writing. He prepared an English version of *Faust,* which, with other of his plays was produced in Australia, and published *The Translations of A Savage* (1893), *The Trail of the Sword* (1894), *When Valmond Came to Pontiac* (1895), *The Seats of the Mighty* (1896), etc.

PARKER, Joel, ll.d., 1795–1875; b. N. H.; graduated at Dartmouth college in 1811. He was admitted to the bar, and began to practice at Keene. He soon attained a considerable practice, which he gave up in 1833, to become an associate justice of the supreme court of New Hampshire; and he was appointed chief-justice in 1838. He was chairman of the committee appointed in 1840 to revise the statutes of New Hampshire. In 1847 he was called to a chair in the Harvard law school. He was prominent in the proceedings of the Massachusetts constitutional convention of 1853. In politics he was a conservative, and opposed, during the civil war, to the exercise of what he deemed unconstitutional powers by the president. He published *Non-Extension of Slavery,* 1856; *Personal Liberty Laws,* and *The Right of Secession,* 1861; *Constitutional Law,* 1862; *War Powers of Congress and the President,* 1863; *Revolution and Reconstruction,* 1866; and *Conflict of Decisions,* 1871.

PARKER, Joel, ll.d., b. N. J., 1816; educated at the college of New Jersey, and admitted to the bar in 1842. He was a member of the legislature in 1847, and afterward county attorney. He received a commission as maj.gen. of volunteers in 1861. He was governor of New Jersey, 1862–65, and again, 1871. He was a candidate for the democratic nomination for president in the convention at St. Louis in 1876, but failed to receive a large vote. He d. 1888.

PARKER, Rev. Joseph, d.d., A minister of the City temple, London, was b. at Hexham, 1830; educated at University college, London, 1852. He was ordained in the Congregational body in 1853. He has held the following church appointments: Banbury (1853), Manchester (1858), London, Poultry chapel (1869), and City temple, High Holborn, since 1893. He was chairman of the London Congregational Union in 1890; and is the founder of Nottingham Congregational Institute. Among numerous works written by him may be mentioned: *The Paraclete, Ecce Deus, Springdale Abbey, Inner Life of Christ* (3 vols.), *Apostolic Life* (3 vols.), and *Weaver Stephen.* Dr. Parker in 1888 visited the United States, and was regarded as a candidate for the pastorate of Plymouth church, Brooklyn. During 1889 he issued *The People's Prayer Book,* to which additions were made in 1890.

PARKER, Matthew, the second Protestant archbishop of Canterbury, was born at Norwich, Aug. 6, 1504, studied at Corpus Christi college, Cambridge, and was ordained a priest in 1527. At the university he was a distinguished student, especially of the Scriptures and of the history of the church, even to antiquarian minuteness; yet, in spite of his strong leaning to the past, he was from an early period favorably disposed toward the doctrines of the Reformation, and lived in close intimacy with some of the more ardent reformers. In 1533 he was appointed chaplain to queen Anne Boleyn, who thought very highly of him, and not long before her death exhorted her daughter Elizabeth to avail herself of Parker's wise and pious counsel. In 1535 he obtained the deanery of the monastic college of Stoke-Clare in Suffolk. Here, too, he appears for the first time to have definitely sided with the reforming party in the church and state, the sermons which he preached containing bold attacks on different Catholic tenets and practices. In 1538 Parker took the degree of d.d.; and in 1544, after some minor changes, became master of Corpus Christi college, Cambridge, which he ruled admirably. Three years later he married Margaret Harlstone, the daughter of a Norfolkshire gentleman. It was probably about this time that he drew up his defense of the marriage of priests, entitled *De Conjugio Sacerdotum.* In 1552 he was presented by King Edward VI. to the canonry and prebend of Covingham, in the church of Lincoln. On the accession of queen Mary he refused to conform to the re-established order of things, and was deprived of his preferments, and even obliged to conceal himself. It does not appear, however, that he was eagerly sought after by the emissaries of Mary; for he was very unwilling to disturb the framework of the church. Parker spent at least some portion of his compulsory seclusion from public life in the enlargement of his *De Conjugio Sacerdotum,* and in translating the Psalms into English meter. The death of Mary, and the accession of Elizabeth, called him from that learned retirement of which he seems to have been sincerely fond. Sir Nicholas Bacon, now lord-keeper of the great seal, and Sir William Cecil, secretary of state, both old Cambridge friends, knew what a solid and sure judgment, what a moderate and equable spirit, and above all, what a thorough faculty for business, ecclesiastical and secular, Parker had, and by their recommendation he was appointed by the queen,

archbishop of Canterbury. The consecration took place in Lambeth chapel, Dec. 17, 1559.

"The subsequent history of Archbishop Parker," it has been justly remarked, "is that of the church of England." The difficulties that beset him were very great. Elizabeth herself was much addicted to various "popish" practices, such as the idolatrous use of images, and was strongly, we might even say violently, in favor of the celibacy of the clergy. She went so far as to insult Parker's wife on one occasion. But his greatest anxiety was in regard to the spirit of sectarian dissension within the bosom of the church itself. Already the germs of *puritanism* were beginning to spring up, and there can be no doubt that their growth was fostered by the despotic caprices of the queen. Parker himself was manifestly convinced that if ever Protestantism was to be firmly established in the land at all, some definite ecclesiastical forms and methods must be sanctioned to secure the triumph of order over anarchy, and so he vigorously set about the repression of what he thought a mutinous individualism incompatible with a Catholic spirit. That he always acted wisely or well, cannot be affirmed; he was forced, by virtue of his very attitude, into intolerant and inquisitorial courses, and as he grew older he grew harsher, the conservative spirit increasing with his years. To forbid "prophesyings," or meetings for religious discourse, was something very like persecution, though probably enough something very like treason to the church was talked in these pious conventicles. Fuller (who must have his pun, however bad) says of him: "He was a Parker indeed, careful to keep the fences." Yet it must not be forgotten that it is to Parker we owe the *Bishop's Bible*, undertaken at his request, carried on under his inspection, and published at his expense in 1568. He had also the principal share in drawing up the *Book of Common Prayer*, for which his skill in ancient liturgies peculiarly fitted him, and which strikingly bears the impress of his broad, moderate, and unsectarian intellect. It was under his presidency, too, that the *Thirty-nine Articles* were finally reviewed and subscribed by the clergy (1562). Parker died, May 17, 1575.

Among other literary performances, Parker published an old *Saxon Homily on the Sacrament*, by Ælfric of St. Albans, to prove that transubstantiation was not the doctrine of the ancient English church; edited the histories of Matthew of Westminster and Matthew Paris (q.v.); and superintended the publication of a most valuable work, *De Antiquitate Britannicæ Ecclesiæ*, probably printed at Lambeth in 1572, where the archbishop, we are told, had an establishment of printers, engravers, and illuminators. He also founded the "society of antiquaries," and was its first president; endowed the university of Cambridge, and particularly his own college, with many fellowships and scholarships, and with a magnificent collection of MSS. relating to the civil and ecclesiastical condition of England, and belonging to nine different centuries (from the 8th to the 16th). Of this collection Fuller said that it was "the sun of English antiquity before it was eclipsed by that of sir Robert Cotton."

PARKER, Peter, b. Mass., 1804; graduated at Yale college in 1831; studied theology and medicine at New Haven; was ordained and went to China as a missionary in 1834. He established a hospital at Canton, principally for eye-diseases, but soon for other diseases. The first year over 2,000 patients were treated. Dr. Parker wrought wonderful surgical cures, and his fame spread rapidly. He made it a point to preach to the inmates, and trained several Chinese students in surgery and medicine. In 1837 he visited the Loo-Choo islands and Japan. War breaking out in 1840 between England and China, the hospital was closed, and Dr. Parker returned to the United States. In 1842 he went back to China and reopened the hospital, which was soon crowded as before. In 1845 he resigned his connection with the American board, and became secretary to the U. S. legation and interpreter of the new embassy, still having charge of the hospital. In the absence of the minister he acted as *chargé d'affaires*. in 1855, his health having failed, he again visited the United States, but by request of the government he returned the same year to China as commissioner with full power to revise the treaty of 1844. This position he held until a change of administration in 1857, when, his health again failing, he returned to the United States, and settled in Washington. He was a regent of the Smithsonian institution, and filled other scientific positions. He published *A Statement Respecting Hospitals in China*, etc. He d. in 1888.

PARKER, Theodore, an American clergyman and scholar, was born at Lexington, Massachusetts, Aug. 24, 1810. His grandfather was capt. of a militia company at the battle of Lexington, his father a farmer and mechanic, and his own boyhood was spent at the district school, on the farm, and in the workshop. At the age of 17 he taught a school, and earned money to enter Harvard college in 1830. During his collegiate course, he supported himself by teaching private classes and schools, and studied metaphysics, theology, Anglo-Saxon, Syriac, Arabic, Danish, Swedish, German, French, Spanish, and modern Greek. Entering the divinity class, at the end of his collegiate course, he commenced preaching in 1836, was an editor of the *Scriptural Interpreter*, and settled as Unitarian minister at West Roxbury in 1837. The naturalistic or rationalistic views which separated him from the more conservative portion of the Unitarians, first attracted wide notice, in consequence of an ordination sermon, in 1841, on *The Transient and Permanent in Christianity*. The contest which arose on the anti-supernaturalism of this discourse, led him to further develop his theological views in five lectures, delivered

in Boston, and published (1842) under the title of *A Discourse of Matters Pertaining to Religion,* which was followed by *Sermons for the Times.* Failing health induced him to make an extended tour in Europe. In 1845 he returned to Boston, preached to large audiences at the Melodeon, and wrote for the *Dial, Christian Register, Christian Examiner,* and *Massachusetts Quarterly.* He became also a popular lecturer, and was active and earnest in opposition to slavery, the Mexican war, and the fugitive slave law, for resisting which, by more than words, he was indicted. In the midst of his work, he was attacked, in 1859, with bleeding from the lungs, and made a voyage to Mexico, where he wrote his *Experience as a Minister,* whence he sailed to Italy, where he died at Florence, May 10, 1860. His works, consisting chiefly of miscellanies, lectures, and sermons, have been collected and published in America and England, in which his peculiar views in theology and politics are sustained with great force of logic and felicity of illustration. His learning was equal to his energy and philanthropy, and his influence was also great. His library of 13,000 volumes he bequeathed to the Boston free library. See Parker's *Life and Correspondence,* by Weiss (1864).

PARKER, Thomas, 1595–1677; b. England; studied at Oxford, in Ireland under Dr. Usher, and at Leyden in 1617. He taught and preached in Newbury, England; went to New England in 1634; was colleague with the Rev. Mr. Ward at Ipswich, Mass., and then settled at Newbury in 1635. His church was divided by a long controversy on church government, but he remained its pastor till his death. His publications are: *The Prophecies of Daniel Expounded; Methodus Gratiæ Divinæ; Theses de Traductione Peccatoris ad Vitane.* He published also a letter to a member of the Westminster assembly on church government, and edited the works of the Puritan Dr. Ames.

PARKER, Willard, ll.d., b. N. H., 1800; graduated at Harvard 1826, and began the study of medicine with John C. Warren, professor of surgery in the medical department of Harvard university; graduated in 1830, when he was appointed professor of anatomy in the Vermont medical college. During the same year he was also appointed professor of anatomy in the Berkshire medical college, in which latter institution he became professor of surgery in 1833. In 1836 he accepted the chair of surgery in the Cincinnati medical college. The following year he visited Europe and spent considerable time in the hospitals of Paris and London. After his return, in 1839, he was appointed professor of surgery in the college of physicians and surgeons of New York, a position he held for thirty years. He then resigned and was appointed professor of clinical surgery, lecturing once a week at the *clinics.* In 1865 he was made president of the New York state inebriate asylum at Binghamton; '67, member metropolitan board of health. He made many contributions to the science of surgery, among which are the performance of the operation of cystotomy for the treatment of some cases of chronic cystitis, and the establishment of a system of rational treatment in cases of abscess of the *appendix vermiformis.* He was also the first to point out the fact that nerve branches became the subject of concussion, as well as the nerve centers, a condition which had previously been confounded with inflammation or congestion. Dr. P. was also a successful operator in many important cases of ligaturing. See Ligature. He d., 1884.

PARKERSBURG, city and co. seat of Wood co., W. Va.; on the Ohio river at the mouth of the Little Kanawha, and on the Baltimore and Ohio, the Baltimore and Ohio Southwestern, and the Ohio River railroads; 96 miles s.w. of Wheeling. It is regularly laid out in squares, with streets 60 ft. wide; on a plateau 100 ft. above the river, the ascent being a gradual rise from the water's edge, and the limits of the city extending for 1 m. on the Ohio river, and 2 m. on the Little Kanawha. In the background is an elevation called Prospect hill. A railroad bridge spans the Ohio at this point, erected in 1869–71 at a cost of $1,000,000; 1⅛ m. long, 6 spans over the river. It has regular lines of steamers to Wheeling, Charleston, and Cincinnati, the Little Kanawha being navigable 38 m. above this place. It is favorably located, the center of a fertile agricultural region, and of an active and constantly increasing trade. There are several noted medicinal springs 6½ m. from the city, and petroleum wells of great value. Salt is among its mineral products. Among its manufactories are barrel factories, lumber mills, iron foundries, machine shops, furniture and chair factories, oil refinery, and veneer and panel works. There are a U. S. government building, high school, seminary, academy of the visitation, national and state banks, electric lights, street railroads, waterworks with high pressure, shops of the Ohio River railroad, about 12 churches, and daily, weekly, and monthly periodicals. Pop. '90, 8408.

PARKES, Sir Harry Smith, b. in England in 1828. After receiving a good education he went out to China, in the British civil service, at the time of the opium war in 1840. Rapidly rising, by reason of his energy and knowledge of the Chinese language, he was appointed British consul at Canton. The Chinese constabulary force seized the British lorcha *Arrow,* Oct. 8, 1856, and took therefrom 12 Chinese sailors. The action of Mr. Parkes in demanding from mandarin Yeh their return to the British consulate, and his speedy notification of the act to the British naval commander, led to the bombardment of Canton and the capture of the forts and city, Dec. 28, 1857. In July, 1860, he left Canton to join lord Elgin in the n. of China, where the large naval forces of England and France were assembling off the Pei-ho. After the capture of Tientsin, Aug. 24, and while the allied forces were moving on to Peking, a conference with the Chinese

was attempted at Tungchow. Consul Parkes, with 25 men, were sent forward with a flag of truce, but were seized by the Chinese, and kept prisoners in cages. Thirteen were barbarously murdered, and the remainder tortured and nearly starved. While a prisoner in a cage, Parkes sent word to lord Elgin not to delay or in any way compromise on his account. The treatment of Parkes and his companions left the allies no course but to proceed to Peking, before which they arrived, Oct. 6. Parkes and the survivors of his party were delivered to the British forces, Oct. 9, but in retaliation for the cruelties and murders inflicted the imperial summer palace was destroyed and pillaged. For his courage and skill, Parkes was rewarded with the title K.C.B., and appointed minister to Japan, arriving at Yokohama June 30, 1865. With characteristic insight, he soon learned the truth that the mikado and not the tycoon was the sovereign of Japan. He was the first foreign diplomat to recognize the new government of Japan as it rose out of the revolution of 1868. He negotiated treaties between J. and 13 European nations; was made minister to China, 1883. He d., 1885.

PARKES, SIR HENRY, K.C.M.G., was the son of an agricultural laborer, and born at Warwickshire, England, 1815. He emigrated to Sydney in 1839. Elected to the New South Wales parliament as member for Sydney in 1854, he became colonial secretary (1866), and distinguished himself by carrying the New South Wales public schools act. He was prime minister in 1872–5, 1877, 1878–83, 1887–89, and 1889–91. Sir Henry was distinguished for his successful advocacy of free trade and as one of the remarkable men who have risen to political eminence through journalism. For seven years he conducted the *Empire*, a daily newspaper of Sydney. He visited England in 1861, in 1881, and again in 1887 as the representative of New South Wales at the colonial conference which met in London, and which has been described by Lord Rosebery as the "inauguration of Imperial Federation" (q.v.). He d. in 1896.

PAR'KESINE, the name given to a substance introduced for manufacturing purposes by Mr. Parkes of Birmingham. In that town, where so many kinds of small objects are made in countless thousands daily, it is of great importance to get hold of a cheap material which will in some measure partake of the properties of ivory, bone, horn, tortoise-shell, hard wood, india-rubber, or other natural substances. There are a number of artificial compositions which to some extent do this, and Parkesine is one of these. It is said to be a mixture of pyroxyline (gun-cotton) and oil, hardened with chloride of sulphur. The pyroxyline is made from any vegetable fiber, as cotton and flax waste, or rags. According to another account, it is composed of castor oil, collodion, and wood spirit. For large and cheap objects other materials and solvents can be used, to which saw-dust, cork-dust, or pigments may be largely added.

In a paper read before the society of arts on the subject of Parkesine, and in a discussion which followed the reading, it was stated that this substance is not affected by sea-water; it does not soften, like gutta-percha, by heat; it is a good insulator of electricity, even at a temperature of 212° F.; it may be made either opaque or transparent, plain or colored; it will make a very strong joint after fracture; it will resist most acids.

PARKHURST, CHARLES HENRY, D.D., b. Framingham, Mass., 1842; graduated at Amherst college, 1866, and studied theology at Leipsic and at Halle. He was pastor of the Cong. church, Lenox, Mass., 1874–80; then became pastor of the Madison Square Presb. church, New York. In 1891 he was elected successor to the Rev. Howard Crosby, D.D., as president of the society for the prevention of crime, and in 1892 made a remarkable sensation by his methods of exposing vice and the alleged complicity of the New York police force with law-breaking. Largely to his efforts is to be attributed the defeat of the local Tammany ticket in the election of 1894. Since then Dr. Parkhurst has been in great demand as a lecturer.

PARKHURST, JOHN, an English biblical scholar, the second son of John Parkhurst, esq., of Catesby, in Northamptonshire, was b. in June, 1728, educated at Rugby and at Clare Hall, Cambridge, where he took his degree of M.A. in 1752, and in 1753 published *A Serious and Friendly Address to the Rev. John Wesley, in Relation to a Principal Doctrine advanced and maintained by him and his Assistants.* The doctrine assailed in Parkhurst's pamphlet was the favorite Wesleyan doctrine of "Assurance." In 1762 appeared his principal work—indeed the only thing that has preserved his name—*A Hebrew and English Lexicon, without Points, adapted to the Use of Learners.* Parkhurst kept mending this Hebrew lexicon all his life. It was a very creditable performance for its time, and long continued to be the standard work on the subject among biblical students in this country; but it is disfigured by its fanciful etymologies, partly the result of his having (like many other divines of his time) adopted the irrational and presumptuous theories of Hutchinson (q.v.), and is now entirely superseded by the works of Gesenius, Ewald, and other critical scholars. Parkhurst also wrote a treatise (1787) against Dr. Priestley, to prove the divinity and pre-existence of Jesus Christ. He died in 1797.

PARKINSO'NIA, a genus of plants of the natural order *leguminosæ*, sub-order *cæsalpinieæ*.—*P. aculeata* is a West Indian shrub or small tree, which, when in flower, is one of the most splendid objects in the vegetable kingdom. It has pinnated leaves, with winged leaf-stalk, and large yellow flowers spotted with red. It is furnished with strong spines, and is often used for hedges, whence it is called the Barbadoes flower fence. It is now

common in India. The bark yields a beautiful white fiber, which, however, is not very strong; but it has been suggested that it might be found suitable for paper-making.

PARKMAN, FRANCIS, DD., 1788–1852; b. Boston; graduated at Harvard in 1807, and prepared for the ministry under Channing and at Edinburgh. In 1813 he was settled over the new North (Unitarian) church, where he continued to be pastor till 1849. He published, in 1829, *The Offering of Sympathy*. The Parkman professorship of pulpit eloquence in the Harvard divinity school is his foundation.

PARKMAN, FRANCIS, b. Boston, 1823; graduated at Harvard in 1844, and began the study of the law. He gave up the law in 1846, and made a journey to the Rocky mountains, living for a time among the Dakota Indians, and suffering hardships which seriously impaired his health. He embodied his western experiences in his *Prairie and Rocky Mountain Life*, better known under its later title of *California and the Oregon Trail*. In 1856 he published a novel called *Vassall Morton*. For more than thirty years he studied the history of the French power in America, and his works on various branches of that subject are of the first authority. The first of his series of works on this topic was *The Conspiracy of Pontiac*, which appeared in 1857. It was followed by the *Pioneers of France in the New World* (1865); *The Jesuits in North America* (1867); *The Discovery of the Great West* (1869); *The Old Régime in Canada* (1874); *Count Frontenac and New France under Louis XIV.* (1878), and *Montcalm and Wolfe* (2 vols., 1884). He made two visits to France for the purpose of examining authorities and consulting the French archives. Like Prescott, his sight was so impaired as to make it impossible for him to read or write. In spite of this disadvantage, his historical works show accurate investigation, and are distinguished for impartiality and candor, no less than for grace of style. He likewise gave much attention to horticulture, published in 1866 *The Book of Roses*, and was made professor of horticulture in the Bussey institution connected with Harvard university, 1871, but resigned the position in 1872. He died Nov. 8th, 1893.

PARLEY, in military language, is an oral conference with the enemy. It takes place under a flag of truce, and usually at some spot—for the time neutral—between the lines of the two armies.

PARLIAMENT (Fr. *parlement*, from *parler*, to talk), the supreme legislature of the United Kingdom of Great Britain and Ireland. The word was first applied, according to Blackstone, to general assemblies of the states under Louis VII., in France, about the middle of the 12th c.; but in that country it came eventually to be the designation of a body which performed certain administrative functions, but whose principal duties were those of a court of justice.

The origin of the parliament of England has been traced to the Saxon great councils of the nation, called "Witena-gemote," or meeting of wise men. These had, however, little in common with the parliaments of a later date: among other points of difference, they had a right to assemble when they pleased without royal warrant. Even under the Norman kings, the great council formed a judicial and ministerial as well as a legislative body, and it was only gradually that the judicial functions were transferred to courts of justice, and the ministerial to the privy council—a remnant of the judicial powers of parliament being still preserved in the appellate jurisdiction of the house of lords. Under the Norman kings, the council of the sovereign consisted of the tenants-in-chief of the crown, who held their lands *per baroniam*, lay and ecclesiastic. It was the principle of the feudal system that every tenant should attend the court of his immediate superior; and he who held *per baroniam*, having no superior but the crown, was bound to attend his sovereign in the great council or parliament. In the charter of king John, we for the first time trace the germ of a distinction between the peerage and the lesser nobility, the archbishops, bishops, abbots, earls, and greater barons being required to attend by a writ addressed to each, and the other tenants-in-chief by a general summons by the sheriffs and bailiffs. Baronial tenure originally made a man a baron or lord of parliament. When the offices or titles of earl, marquis, or duke were bestowed on a baron, they were conferred by royal writ or patent, and at length barony came also to be conferred by writ instead of by tenure. During the 13th c., the smaller barons were allowed, instead of personally attending the national council, to appear by representatives; but the principle of representation seems first to have been reduced to a system when permission was also given to the municipalities, which, as corporations, were chief tenants of the crown, to appear by representatives. It is not quite clear when the division of parliament into two houses took place; but when the representatives of the minor barons were joined by those of the municipalities, the term commons was applied to both. The lower house was early allowed to deal exclusively with questions of supply; and seems, in the reign of Richard II., to have established the right to assign the supplies to their proper uses. As the commons became more powerful, they came to insist on the crown redressing their grievances before they would vote the supplies. The influence of parliament was on the increase during the Tudor period, while the reign of the Stewarts was characterized by a struggle for supremacy between the parliament and the crown, each striving to acquire the control of the military force of the country. The powers of the different estates came to be more sharply defined at the revolution of 1688. Nineteen years later, on the union of Scotland, the parliament of England was merged into that of Great Britain. See ESTATES OF THE REALM.

In its early history, prior to the war of independence, the parliament of Scotland had probably not been very unlike that of England; it assembled without warrant, and consisted of bishops, earls, priors, abbots, and barons. At the close of the 13th c., the constitutional history of Scotland diverges from that of England. The addition of the burghs to the national council seems to date from the beginning of the 14th c., but it was not till much later that the lesser barons began to be exempted from attendance. The first act excusing them belongs to the reign of James I., and allows them to choose representatives called speakers, two for each county, excepting some small counties, which were to have but one, the expenses of the representatives being defrayed by the constituency. The Scottish parliament was never, like the English, divided into two houses; all sat in one hall, and though it consisted of three estates, a general numerical majority of members was considered sufficient to carry a measure. The greater part of the business was transacted by the lords of the articles, a committee named by the parliament at the beginning of each session, to consider what measures should be passed; and whatever they recommended was generally passed without discussion. It was never held indispensable that the parliament should be summoned by the crown, and it has even been thought that the royal assent to the measures carried was not absolutely essential. The parliament which carried the reformation had no royal sanction. The union was adjusted by commissioners for each country selected by the crown, and passed first, after strong and protracted opposition, in Scotland, and afterward more easily in England.

By the act of union with Ireland in 1800 (Act 39 and 40 Geo. III. c. 67), the Irish parliament was united with that of Great Britain as the parliament of the United Kingdom of Great Britain and Ireland. The parliament of Ireland had been originally formed on the model of that of England about the close of the 13th c., but it was merely the very small portion of Ireland occupied by the English settlers that was represented, which, as late as the time of Henry VII., hardly extended beyond the counties of Dublin, Louth, Kildare, and Meath, and constituted what was called the Pale. It was only for the last few years of its existence that the Irish parliament was a supreme legislature; the English parliament having down to 1783, had power to legislate for Ireland. By one of the provisions of Poyning's Act, passed in 1495, no legislative proposals could be made to the Irish parliament until they had received the sanction of the king and council in England. Act 23 Geo. III. c. 28 gave the Irish parliament exclusive authority to legislate for Ireland, and the abuse of this power so obstructed the machinery of government, as to render the union of 1800 matter of necessity.

The power of parliament is, according to sir Edward Coke, so transcendent and absolute, that it cannot be confined either for persons or causes within any bounds. All remedies which transcend the ordinary courts of law are within its reach. It can alter the succession to the throne, the constitution of the kingdom, and the constitution of parliament itself. It has its own law, to be learned from the rolls and records of parliament, and by precedents and experience. One of the most thoroughly established maxims of this law is, that whatever question arises concerning either house of parliament ought to be discussed and adjudged there, and not elsewhere. The house of lords will not allow the commons to interfere in a question regarding an election of a Scotch or Irish peer; the commons will not allow the lords to judge of the validity of the election of a member of their house, nor will either house permit courts of law to examine such cases. The authority of parliament extends to British colonies and foreign possessions. In the ordinary course of government, however, parliament does not make laws for the colonies. For some the queen in council legislates; others have legislatures of their own, which propound laws for their internal government, subject to the approbation of the queen in council: but these may be repealed and amended by parliament.

The constituent parts of parliament are the sovereign, the house of lords, and the house of commons. In the sovereign is vested the whole executive power; the crown is also the fountain of justice, from whence the whole judicial authority flows. To the crown is intrusted the permanent duty of government, to be fulfilled in accordance with the law of the realm, and by the advice of ministers responsible to parliament. The sovereign is also invested with the character of the representation of the majesty of the state. The sovereign's share in the legislature includes the summoning, proroguing, and dissolving of parliament. Parliament can only assemble by act of the sovereign; in but two instances have the lords and commons met of their own authority—viz., previously to the restoration of Charles II., and at the convention parliament summoned at the revolution of 1688; and in both instances it was considered necessary afterward to pass an act declaring the parliament to be a legal one. Though the queen may determine the period for assembling parliament, her prerogative is restrained within certain limits. She is bound by statute (16 Chas. II. c. 1; and 6 and 7 Will. and Mary c. 2) to issue writs within three years after the determination of a parliament; and the practice of voting money for the public service by annual enactments, renders it compulsory for the sovereign to meet parliament every year. Act 43 Geo. III. c. 90 provides that the sovereign shall assemble parliament within fourteen days, whenever the militia shall be drawn out and embodied in case of apprehended invasion and rebellion; and a similar proviso is inserted in Act 15 and 16 Vict. c. 50, in case the present militia force should be raised to 120,000 men, and embodied. The royal assent is necessary before any

measure can pass into law. The crown, as the executive power, is charged with the management of the revenues of the state, and with all payments for the public service; it is therefore the crown that makes known to the commons the pecuniary necessities of the government, without which no supplies can be granted. The sovereign's prerogative also includes the sending and receiving of ambassadors, entering into treaty with foreign powers, and declaring war or peace. All the kings and queens since the revolution have taken an oath at their coronation "to govern according to the statutes in parliament agreed on, and the laws and customs of the same." The sovereign is further bound to an adherence to the Protestant faith, and the maintenance of the Protestant religion as established by law. By the bill of rights (1 Will. and Mary c. 2, s. 6), and the Act of Settlement (12 and 13 Will. III. c. 2, s. 2) a person professing the popish religion, or marrying a papist, is incapable of inheriting the crown, and the people are absolved from their allegiance. This exclusion is further confirmed by the act of union with Scotland; and in addition to the coronation oath, every king or queen is required to take the declaration against the doctrines of the Roman Catholic church prescribed by 30 Chas. II. c. 2, either on the throne in the house of lords in the presence of both houses, at the first meeting of the first parliament after the accession, or at the coronation whichever event shall first happen. The sovereign is bound by similar sanctions to maintain the Protestant religion and Presbyterian church government in Scotland.

The province of the houses of parliament is to legislate with the crown, to provide supplies, to exercise a supervision over the ministers of the crown and all other functionaries, and to advise the sovereign on matters of public moment. The upper house, from its hereditary and aristocratic character, is a check on the popular branch of the legislature and on hasty legislation.

The house of lords may originate legislative measures of all kinds, except money-bills. Acts of grace and bills affecting the rights of peers must originate in this house. In its judicial capacity, defined by the appellate jurisdiction act, 1876, it forms a court of final appeal from her majesty's court of appeal in England, from the court of session, Scotland, and the superior courts of law and equity of Ireland. It has a judicature in claims of peerage and offices of honor under reference from the crown. Since the union with Scotland and Ireland, it has had the power of deciding disputed elections of representative peers. It tries offenders impeached by the house of commons, and members of its own body on indictment found by a grand jury. The house of lords is composed of lords spiritual and temporal. According to a declaration of the house in 1672, the lords spiritual are only lords of parliament and not peers, a distinction which seems not to have been known in ancient times. They consist of 2 archbishops and 24 bishops for England, who are said to have seats in virtue of their temporal baronies. (By the act of 1869, the Irish church, which formerly sent 4 bishops, is no longer represented.) The bishop of Sodor and Man has no seat in parliament, and on Manchester being made a see in 1847, it was arranged that one other bishop should be in the same position, according to a rotation not including the bishops of London, Durham, and Winchester, so as not to increase the number of the lords spiritual.* The lords temporal consist of: 1. The peers of England, of Great Britain, and of the United Kingdom, of whom there were, in 1886, 6 princes of the royal blood, 21 dukes, 20 marquises, 119 earls, 28 viscounts, and 274 barons. The number of the peers of the United Kingdom may be increased without limit by new creations at the pleasure of the sovereign. 2. Sixteen representatives chosen from their own body by the peers of Scotland for each parliament. As no provision was made at the union for any subsequent creation of Scottish peers, the peerage of Scotland consists exclusively of the descendants of peers existing before the union. By order of the house of lords, an authentic list of the Scottish peers was entered on the roll of peers on Feb. 12, 1708, to which all claims since established have been added; and in order to prevent the assumption of dormant and extinct peerages by persons not having right to them, statute 10 and 11 Vict. c. 52, provides that no title standing in the roll, in right of which no vote has been given since 1800, shall be called over at an election without an order of the house of lords. 3. Twenty-eight representatives of the Irish peerage, elected for life. Most peerages are still hereditary. Life peerages were in early times not unknown to the constitution; but in 1856, her majesty having created lord Wensleydale a peer for life, the house of lords decided he could not sit and vote. But in 1876, peers to sit as members of the house while they held the office of lords of appeal in ordinary—i.e., for judicial business, but on ceasing to act as judges to be peers no longer—were created by statute. The house has also power to call to its assistance in legal and constitutional questions the judges of the supreme court of judicature of all the four divisions, who advise what should be done. The house has power also to sit for judicial business during the prorogation of parliament. The votes of spiritual and temporal lords are intermixed, and the joint majority determine every question; but they sit apart on separate benches—the place assigned to the lords spiritual being the upper part of the house on the right hand of the throne. A lord may, by license from the sovereign, appoint another lord as his proxy to vote for him in his absence; but a lord spiritual can only be proxy for a lord spiritual, and a lord temporal for a lord temporal, and no member of the house can hold more than two proxies at the same time. Proxies cannot vote in judicial questions or in committees of the whole house. There are other rules and restrictions incident to the right of vote by proxy; a lords' committee

* The same rule applies to the new sees, St. Albans, Truro, Liverpool, Newcastle, and Southwell.

in 1867 reported that the practice of using proxies should be discontinued, but no alteration in the rules was agreed to. Peerages are lost by attainder for high treason. Neither the issue of the body of the person attainted, nor, on their failure, the descendants of the person first called to the dignity, will be admitted to it without a removal of the attainder. But where the attainted person is tenant in tail-male, with a remainder in tail-male to another, the dignity becomes vested in the remainder man on failure of the issue of the person attainted. A peerage, whether by patent or writ, is forfeited by attainder for high treason; attainder for felony forfeits a peerage by writ, not one by patent. An attainted peerage cannot be restored by the crown, only by an act of parliament.

The house of commons, besides its general power to introduce legislative measures, has the sole right to originate bills levying taxes, or affecting the public income and expenditure, and to examine into the validity of elections to its own body. The question whether it has any control over the rights of electors was the subject of a memorable contest between the lords and commons in 1704, in the cases of Ashby and White, and of the "Aylesbury men" (*Hatsell's Precedents*, vol. iii.), a contest ended by the queen proroguing parliament. When inquiring into the conflicting claims of candidates for seats in parliament, the commons have an undoubted power to determine whether electors have the right to vote. The house of commons has the right to expel or commit to prison its own members, and to commit other persons who offend by breach of its privileges, contempt of its authority, disobedience of its orders, or invasion of its rights; but this power is limited to the duration of the session. Expulsion does not, however, create any disability to serve again in parliament. The house of commons has also the power of impeaching offenders, who, however, are tried at the bar of the house of lords.

The number of members of the house of commons has varied greatly at different times. In the reign of Edward I., it seems to have been 275; in that of Edward III., 250; and of Henry VI., 300. In the reign of Henry VIII., 27 members were added for Wales, and 4 for the county and city of Chester; 4 were added for the county and city of Durham in the reign of Charles II. Between the reign of Henry VIII. and that of Charles II., 180 new members were added by the granting of royal charters to boroughs which had not previously returned representatives. Forty-five members were assigned as her proportion to Scotland at the union, and 100 to Ireland, making the whole number of members of the house of commons of the United Kingdom 658. The reform acts of 1832, 2 Will. IV. c. 45 for England, 2 and 3 Will. IV. c. 65 (amended by 4 and 5 Will. IV. c. 88, and 5 and 6 Will. IV. c. 78) for Scotland, and 2 and 3 Will. IV. c. 88 for Ireland, while leaving unaltered the whole number of members of the house of commons, made great changes in the distribution of their seats. Fifty-six boroughs in England and Wales were entirely disfranchised; 30 which had previously returned two members were restricted to one; while 42 new boroughs were created, of which 22 were each to return two members, and 20 a single member. Several small boroughs in Wales were assigned to the city of London, 2 to each of the universities of Oxford and Cambridge, and one to 133 cities and boroughs. The number of members for Scotland was increased from 45 to 53, 30 being county and 23 borough members, some of the latter representing several combined boroughs. The number of members for Ireland was increased from 100 to 105, 64 representing counties, 34 cities and boroughs, and 2 the university of Dublin. Further extensive changes in the distribution of seats were made by the recent reform acts of 1867 and 1868, 30 and 31 Vict. c. 102 for England, and 31 and 32 Vict. c. 48 for Scotland. The English act deprived of its second member each borough of less than 10,000 inhabitants, and altogether disfranchised 7 boroughs, giving 45 seats for redistribution, of which 25 were given to the larger counties, 11 to new boroughs, 8 to boroughs already represented, and 1 to the university of London. The Scotch act united the counties of Selkirk and Peebles into one constituency; gave a member to the universities of Edinburgh and St. Andrews, and another to the universities of Glasgow and Aberdeen, a second member to each of the counties of Lanark, Ayr, and Aberdeen, and to the town of Dundee, and a third member to Glasgow; and constituted Hawick, Galashiels, and Selkirk into a new district of boroughs; the 7 new seats required being provided for by a further disfranchisement of small English boroughs. The Irish reform act, 31 and 32 Vict. c. 49, made no change in the distribution of seats. In 1884 the three kingdoms were placed upon an equal footing as regards electoral qualifications. In 1885 a redistribution bill fixed the number of members at 670, distributed as follows:

	Counties.	Boroughs.	Universities.	Total.
England and Wales.....	253	237	5	495
Scotland.....	39	31	2	72
Ireland.....	85	16	2	103
	377	284	9	670

In English counties, prior to the act of 1832, the electoral qualification was founded on the holding of freehold property of the yearly value of 40s.: by that act every person who at the date was seized for his own life and that of another, or for any lives whatever, of a 40s. freehold, or who might be seized subsequently to the act if in occupation,

or who might come into such freehold estate by marriage, marriage-settlement, device, or promotion to any benefice or office, could still vote as a freeholder; but a person not included in these classes, acquiring a freehold subsequently to the act, had only the franchise when it was of the clear yearly value of £10, which value was reduced to £5 by the act of 1867. Copyholders holding an estate of £10 a year, leaseholders of that value whose leases were originally granted for 60 years, leaseholders of £50 with 20 years' leases, and tenants at will occupying lands or tenements paying a rent of £50, had the franchise under the act of 1832; and the act of 1867 reduced the franchise of copyholders and leaseholders from £10 to £5, and the occupation franchise from £50 to £12. In boroughs, the old qualification varied according to local usage, and some of the ancient rights, as that of freemen, were retained in 1832, when the franchise was bestowed on all occupiers of houses of £10 yearly value. The act of 1867 extended the borough franchise to all occupiers of dwelling-houses who have resided for 12 months on July 31, in any year, and have been rated to the poor-rates as ordinary occupiers, and have, on or before July 20, paid such rates up to the preceding Jan. 5, and to lodgers who have occupied for the same period lodgings of the annual value, unfurnished, of £12. In Scotland, the old county qualification consisted in being infeft in lands or superiorities holding directly of the crown of 40s. old extent (see VALUATION), or £400 Scots valued rent; and the Scotch act of 1832 reserved the rights of persons then on the roll of freeholders, or entitled to be put on it, and extended the franchise to all owners of property of the clear yearly value of £10, and to certain classes of leaseholders. By the act of 1868, the county franchise was further extended to proprietors of lands of £5 yearly value, and occupiers of the ratable value of £14. The Scottish burghal franchise had, prior to 1832, been vested in the town-councils: the act of 1832 substituted a £10 household franchise, and that of 1868 conferred the franchise on all occupiers of houses paying rates.

By the Irish reform act of 1832, various classes of freeholders were invested with the county franchise, to whom were added, by 13 and 14 Vict. c. 69, occupiers of land rated for the poor-rate at a net annual value of £12, and persons entitled to estates in fee, or in tail, or for life, of the rated value of £5. The Irish borough qualification was nearly the same as the English, but the above-mentioned statute of Victoria added to the constituency the occupiers of lands and premises rated at £8. The act of 1868 made no change in the county qualification, but gave the borough franchise to occupiers of houses rated at £4, and of lodgings of the annual value of £10 unfurnished. Certain disqualifications exist from exercising the franchise on the grounds of infamy, alienage, conviction of felony, and the holding of government offices. Peers cannot vote. In the universities of Cambridge and Oxford the constituency consists of the doctors and masters of arts; in Dublin, of the fellows, scholars and graduates of Trinity college. In London university the graduates form the constituency; in the Scotch universities the chancellor, the members of the university court, the professors, and the members of general council. Under the acts of 1867–8, in London, where four members are returned, each elector has only three votes; and in Glasgow, which returns three members, each elector has but two votes.

The reform acts of 1832 introduced a system of registration of voters for the three divisions of the United Kingdom. In England lists of voters are prepared by the overseers of each parish, and on certain days courts are held by barristers appointed by the chief-justice and the senior judge of each summer circuit to revise these lists, when claims may be made for persons omitted, and objections offered to names standing on the list. If an objection be sustained, the name is struck off the list, there being an appeal from the decision of the revising barrister to the court of Common Pleas. In Scotland a register of persons entitled to vote is made up annually in counties and boroughs in terms of the registration of voters (Scotland) act, 24 and 25 Vict. c. 23, which register is printed, and may be had for a small price. Voters are thus put on the roll without trouble to themselves, and, in point of fact, without their consent. Enrollment, however, may be challenged, in which case objections are heard and determined by the sheriffs, subject (under the act of 1868) to appeal to a tribunal composed of three judges of the court of session. In 1884 the right of suffrage was extended to householders and lodgers in counties as well as in boroughs, thus introducing a uniform household and lodger franchise throughout the kingdom.

A property qualification of £600 a year in candidates for counties and £300 in candidates for boroughs, which had previously existed in England and Ireland, was left untouched in 1831, but has been abolished by 21 and 22 Vict. c. 26. Scotch peers, though not representative peers, are disqualified from sitting in the house of commons. Irish peers may represent any constituency in Great Britain, but not in Ireland. A disqualification is also attached to judges (except the master of the rolls), clergymen of the established church of any of the three kingdoms, Roman Catholic priests, revenue officers, persons convicted of treason and felony, and aliens, even when naturalized, unless the right has been conceded in express terms. Sheriffs cannot sit for their own counties, and government contractors are disqualified, a disqualification which does not extend to contractors for government loans. A member becoming bankrupt is incapacitated from sitting or voting.

When a new parliament has to be assembled, the lord chancellor, by order of the

sovereign, directs the clerk of the crown to prepare and issue, under the great seal, writs to the sheriffs of counties, both for the counties and the boroughs. A sheriff, on receiving the writ for a county, appoints a day for the election, and by the practice prior to the ballot act, 1872 (35 and 36 Vict. c. 33) on the day fixed, he proclaimed the writ. If no more candidates were then proposed than were to be elected, he declared them duly elected; if there was opposition, a show of hands was asked, and the sheriff declared who had the majority. If a poll was demanded by the opposite party, the election was adjourned. The electors of each district voted at their several polling-places, and at the termination of the poll, the return was transmitted to the sheriff, who proclaimed the successful candidate. In borough elections in England and Ireland, the sheriff, on receiving the writ, issued his precept to the returning officer of the municipality, who superintended the election; in Scotland, the sheriff himself superintended the borough as well as the county elections. The names of the persons elected, both in counties and boroughs, were returned by the sheriff to the clerk of the crown. The candidates are now nominated by a writing signed by two electors, as proposer and seconder, and eight others as consenting, and delivered to the returning officer; if on expiry of an hour from the time fixed there are more candidates than vacancies, the election is adjourned and a poll taken. The vote is given by ballot (q.v.), and the result announced by the returning officer, and returned to the clerk of the crown in chancery. Vacancies occurring after a general election are supplied by new writs issued by authority of the house. When it is determined that a writ should be amended, the clerk of the crown is ordered to attend the house, and amend it accordingly.

A member of the house of commons can not, in theory, resign his seat, but on the acceptance of any office of profit under the crown, his election is, by an act of queen Anne, declared void, and a new writ issues, he being, however, eligible for re-election. By the reform act of 1867, members who already hold certain offices do not vacate their seats on the acceptance of certain other offices enumerated, the list seemingly comprehending all offices usually held by members. The resignation of office is held not to be complete until the appointment of a successor; and on the resumption of office, the seat is held not to have been vacated. A first commission in the army or navy vacates a seat; subsequent commissions do not do so. A member wishing to resign usually applies for the stewardship of the Chiltern Hundreds (q.v.).

Privilege.—Both houses of parliament possess extensive privileges for the maintenance of their authority and the protection of individual members. Some of these privileges have well-defined limits; others are so vague in their extent as occasionally to lead to conflicts between parliament and the courts of law. The privilege of speech is claimed of the sovereign by the speaker of the house of commons at the opening of every new parliament. At the same time, any member using offensive expressions may be called to the bar to receive a reprimand from the speaker; or, if the offense be grave, may be committed for contempt, in which case he is sent either to the tower or to Newgate. Persons not members of the house may also be committed for breach of privilege, and no one committed for contempt can be admitted to bail, nor can the cause of commitment be inquired into by the courts of law. The publication of the debates of either house has repeatedly been declared a breach of privilege; but for a long time back this privilege has been practically waived, except where the reports are false and perverted. Publication of the evidence before a select committee previously to its being reported is punished as a breach of privilege. Libellous reflections on the character and proceedings of parliament, or of members of the house, come under the same category, as also does assaulting or threatening a member. Willful disobedience to the orders of the house is punishable as a breach of privilege; but if orders be given beyond the jurisdiction of the house, their enforcement may be questioned in a court of law. The offer of bribe to, or its acceptance by a member, is a breach of privilege; so also is any interference with the officers of the house in the execution of their duty, or tampering with witnesses who are to be examined before the house, or a committee of the house. Members of both houses are free from arrest or imprisoment in civil matters, a privilege which is permanent in the case of peers, extending also to peeresses, whether by creation or marriage (though the latter lose it by subsequently marrying a commoner), and to peers and peeresses of Scotland and Ireland, whether representative or not. It continues in the case of members of the house of commons during the sitting of parliament, for forty days after each prorogation, for 40 days prior to the day to which parliament is prorogued, and for a reasonable time after a dissolution. Witnesses summoned to attend before parliament or parliamentary committees, and other persons in attendance on the business of parliament, are also protected from arrest. Protection is not claimable from arrest for any indictable offense. Counsel are protected for any statements that they may make professionally.

Meeting of a New Parliament.—On the day appointed for the meeting of a new parliament, the members of the two houses assemble in their respective chambers. In the lords, the lord chancellor acquaints the house that "her majesty, not thinking it fit to be personally present here this day, had been pleased to cause a commission to be issued under the great seal, in order to the opening and holding of the parliament." The lords commissioners, being in their robes, and seated between the throne and woolsack, then command the gentleman usher of the Black Rod to let the commons know that the

"lords commissioners desire their immediate attendance in this house to hear the commission read." Meantime, in the lower house, the clerk of the crown in chancery has delivered to the clerk of the house a list of the members returned to serve; and on receiving the message from Black Rod the commons go up to the house of lords. The commission having been read in presence of the members of both houses, the lord chancellor opens the parliament by stating "that her majesty will, as soon as the members of both houses shall be sworn, declare the causes of her calling this parliament: and it being necessary that a speaker of the house of commons should first be chosen, that you, gentlemen of the house of commons, repair to the place where you are to sit, and there proceed to the appointment of some proper person as your speaker, and that you present such person whom you shall so choose here to-morrow at o'clock, for her majesty's royal approbation." The commons immediately withdraw, and, returning to their own house, proceed to elect a speaker.

Till a speaker is elected, the clerk acts as speaker, standing and pointing to members as they rise to speak, and then sitting down. If only one candidate be proposed for the office, the motion, after being seconded, is supported by an influential member, generally the leader of the house of commons; and the member proposed, having expressed his sense of the honor meant to be conferred on him, is called by the house to the chair, to which he is led by his proposer and seconder. If another member be proposed and seconded, a debate ensues; and at its close, the clerk puts the question, that the member first proposed "do take the chair of the house as speaker." If the house divide, he directs one party to go into the right lobby, and the other into the left, and appoints two tellers for each. If the majority be in favor of the member first proposed, he is led to the chair; if not, a similar question being put regarding the other member, and answered in the affirmative, he is conducted to the chair. The speaker-elect expresses his thanks for the honor conferred on him, and takes his seat; on which the mace is laid on the table, where it is always placed during the sitting of the house with the speaker in the chair. He is then congratulated by some leading member, and the house adjourns. The next day the speaker-elect, on the arrival of Black Rod, proceeds with the commons to the house of lords, where his election is approved by the lord chancellor. He then lays claim, on behalf of the commons, to their ancient rights and privileges, which being confirmed, he retires with the commons from the bar. Nearly the same forms are observed on the election of a new speaker when a vacancy occurs by death or resignation in the course of the session.

The members of both houses then take the oath prescribed by law. See Oath. In the upper house the lord chancellor first takes the oath singly at the table. The clerk of the crown delivers a certificate of the return of the Scottish representative peers, and Garter King-at-arms the roll of the lords temporal, after which the lords present take and subscribe the oath. Peers who have been newly created by letters-patent, present their patents to the lord chancellor, are introduced in their robes between two other peers of their own dignity, preceded by Black Rod and Garter, and conducted to their places. The same ceremony is observed in the case of peers who have received a writ of summons—a formality necessary when a member of the lower house succeeds to a peerage; otherwise his seat does not become vacant. A bishop is introduced by two other bishops, without the formalities observed with temporal lords. Peers by descent have a right to take their seats without introduction; peers by special limitation in remainder have to be introduced. In the commons, the speaker first subscribes the oath, standing on the upper step of the chair, and is followed by the other members. Members on taking the oath are introduced by the clerk of the house to the speaker. Members returned on new writs in the course of the session, after taking the oath, are introduced between two members. They must bring a certificate of their return from the clerk of the crown. On the demise of the crown, the oaths must be taken anew in both houses.

When the greater part of the members of both houses have been sworn, the causes of calling the parliament are declared by the sovereign either in person or by commission. In the former case, the queen proceeds in state to the house of lords, and commands Black Rod to let the commons know "that it is her majesty's pleasure that they attend her immediately in this house." Black Rod proceeds to the house of commons, and formally commands their attendance, on which the speaker and the commons go up to the bar of the house of lords, and the queen reads her speech, which is delivered to her by the lord chancellor kneeling on one knee. Of late years the practice has been revived of the lord chancellor reading the royal speech in the queen's presence. When parliament is opened by commission, the sovereign not being personally present, the lord chancellor reads the royal speech to both houses. Immediately after the royal speech is read, the house is adjourned during pleasure; but both houses are resumed in the afternoon, for the purpose of voting an address in answer to the speech from the throne. In each house it is common to begin business by reading some bill *pro formâ*, in order to assert the right of deliberating without reference to the immediate cause of summons. The royal speech is then read, and an address moved in answer to it. Two members in each house are chosen by the ministry to move and second the address. The preparation of the address is referred to a select committee; it is twice read, may be amended, and when finally agreed on, it is ordered to be presented to her majesty.

Adjournment, Prorogation, and Dissolution.—Adjournment of parliament is but the continuance of the session from one day to another. Either house may adjourn separately on its own authority, with this restriction, introduced by act 39 and 40 Geo. III. c. 14, that the sovereign, with advice of the privy council, may issue a proclamation appointing parliament to meet within not less than 14 days, notwithstanding an adjournment beyond that period. On reassembling, the house can again take up business which was left unfinished. A prorogation differs from an adjournment in this respect that it not merely suspends all business, but quashes all proceedings pending at the time, except impeachments by the commons, and appeals and writs of error in the lords. William III. prorogued parliament from Oct. 21 to Oct. 23, 1689, in order to renew the bill of rights, regarding which a difference had arisen between the two houses that was fatal to its progress. It being a rule that a bill of the same substance cannot be introduced twice in the same session, a prorogation has sometimes been resorted to, to enable a second bill to be brought in. Parliament can only be prorogued by the sovereign; and this may be done by having her command signified in her presence by the lord chancellor to both houses, by writ under the great seal, by commission, or by proclamation. Till recently, a proclamation for the prorogation of parliament from the day to which it stood summoned or prorogued to another day, was followed by a writ or commission; but by 30 and 31 Vict. the royal proclamation alone prorogues parliament, except at the close of a session.

Parliament comes to an end by dissolution. This dissolution may be by the will of the sovereign expressed in person or by her representatives. Having been first prorogued, it is dissolved by a royal proclamation, and by the same instrument it is declared that the chancellor of Great Britain and chancellor of Ireland have been respectively ordered to issue out writs for calling a new parliament. By 6 Anne c. 37, a parliament was determined six months after the demise of the crown; but by the reform act of 1867, the parliament in being at any future demise of the crown shall not be determined by such demise, but shall continue as long as it would otherwise have continued unless dissolved by the crown. Were the power of dissolving the parliament not vested in the executive, there would be a danger of its becoming permanent and encroaching on the royal authority, so as to destroy the balance of the constitution. An example of this danger is shown in the long parliament, to which Charles I. conceded that it should not be dissolved till such time as it dissolved itself. If the houses of parliament encroach on the executive, or act factiously or injudiciously, the crown may, by a dissolution, bring their proceedings to an end, and appeal to the people by sending the members of the house of commons to give an account of their conduct to their constituents.

There was originally no limit to the duration of a parliament except the will of the sovereign. By 6 Will. and Mary, c. 2, the continuance of a parliament was limited to three years, a term afterward extended by 1 Geo. I. c. 38 to seven years. The same act of William and Mary enacts that parliament shall assemble once in three years at the least; but the practice of granting the mutiny act and the budget for a year only, makes it necessary that it should assemble annually.

Conduct of Business.—Each house is presided over by its speaker. The speaker of the house of commons does not take part in a debate, offer his opinion, or vote on ordinary occasions; but, in case of equality, he has a casting vote; his duty is to decide all questions which relate to order, putting the matter at issue in a substantive form for the decision of the house, if his own decision is not assented to. He explains any doubts that may arise on bills. He determines the precedence of members rising to address the house. He examines witnesses at the bar. At the close of the session, he addresses the sovereign on presenting the money-bills passed during the session for the royal assent. He nominates the tellers on a division, and makes known the votes to the house. He may commit members to custody during the pleasure of the house, a confinement which terminates with the close of the session. When a vacancy occurs by death, he signs the warrant to the clerk of the crown to make out the writ for the election of a new member. He audits the accounts of the receiver of fees, and directs the printing of the votes and proceedings of the house. The lord chancellor, or lord keeper of the great seal, is the speaker of the house of lords; in his absence, the chairman of the committee of ways and means takes the chair. The speaker is not, as in the lower house, charged with the maintenance of order, or the decision who is to be heard, which rest with the house itself. The chairman of the committee of ways and means of the house of commons, as deputy speaker, performs the speaker's duties in his absence. The chief officers of the house of lords are the clerk of the parliaments, who takes minutes of the proceedings of the house; the gentleman usher of the black rod, who, with his deputy, the yeoman usher, is sent to desire the attendance of the commons, executes orders for committal, and assists in various ceremonies; the clerk-assistant; and the sergeant-at-arms, who attends the lord chancellor with the mace, and executes the orders of the house for the attachment of delinquents. The chief officers of the commons are the clerk of the house, the sergeant-at-arms, the clerk-assistant, and second clerk-assistant.

Each house has its *Standing Orders*, or regulations, adopted at different periods, relating partly to internal order, partly to certain preliminaries required in the introduction of bills and promulgation of statutes. A standing order endures till repealed (or "vacated," as it is called in the upper house); but each house is also in the practice of

agreeing to certain orders or *resolutions* of uncertain duration declaratory of its practice, which are considered less formally binding than standing orders.

The house of lords usually meets at 5 P.M.; the commons at a quarter before 4, except on Wednesdays and other days specially appointed for morning sittings. In the lords the chancellor, as speaker, sits on the woolsack. A standing order, which is never enforced, requires the lords to take place according to precedence. Practically, the bishops sit together on the right hand of the throne; the members of the administration on the front bench on the right hand of the woolsack adjoining the bishops, and the peers who usually vote with them occupy the other benches on that side. The peers in opposition are ranged on the opposite side, and those considered politically neutral occupy the cross benches between the table and the bar. In the house of commons, the front bench on the right hand of the chair is reserved for the ministry, and called the treasury bench, the front bench on the opposite side being occupied by the leaders of the opposition. By ancient custom and orders of both houses, rarely enforced, strangers are excluded while the houses are sitting.

Prayers are read before business is begun—in the house of lords by a bishop; in the house of commons by the chaplain. Every member is bound to attend the house—in the lower house personally; in the upper personally, or by proxy; but in ordinary circumstances, this obligation is not enforced. The house of lords may proceed to business when three peers are present; in the commons, forty members are required to constitute a house for the dispatch of business. The speaker counts the house at four; and if that number be not then present, or if it be noticed, or appear on a division, that fewer than forty members are present, the house is adjourned. A call of the house is an expedient to secure attendance on important occasions; when it is made, members absent without leave may be ordered to be taken into custody. When matters of great interest are to be debated in the upper house, the lords are "summoned."

To make a motion, or, more properly, to *move the house*, is to propose a question, and notices of motions should be given on a previous day. The commons are in the practice of setting apart Mondays, Wednesdays, Thursdays, and Fridays for considering *orders of the day*, or matters which the house had already agreed to consider on a particular day, and to reserve Tuesdays for motions. Government orders take precedence of others on all order days except Wednesdays, which are generally reserved for the orders of independent members. Notices of motions are by a standing order not allowed to be given for any period beyond the four days next following on which motions are entitled to precedence. Questions of privilege may be considered without previous notices, and take precedence both of other motions and orders of the day. A motion may be accompanied by a speech, and must in the lower house be seconded, otherwise there is no question before the house. In purely formal motions this rule is not observed, and an order of the day may be moved without a seconder. A seconder is not required in the house of lords. A motion in the commons must be reduced to writing by the mover, and delivered to the speaker, who, when it has been seconded, puts it to the house; it cannot then be withdrawn without leave of the house. In the lords, when a motion has been made, a question is proposed "that the motion be agreed to." When an amendment is proposed to a question, the original motion cannot be withdrawn till the amendment has been either withdrawn or negatived. An amendment is properly such an alteration on a motion by striking out or adding words, or both, as may enable members to vote for it who would not have done so otherwise.

A question may be evaded or superseded in four ways: 1. By adjournment. Any member in possession of the house may move "that the house do now adjourn." The house may also be adjourned, even while a member is speaking, on its being noticed that there are fewer than forty members present. The motion, "that the debate be now adjourned," does not supersede the question, but merely defers the decision of the house. 2. By a motion, that the orders of the day be now read, which my be put and carried on days on which notices of motion have precedence. 3. By what is called *moving the previous question*. The act of the speaker in putting the question is intercepted by a motion, "that the question be now put." The mover and seconder of this motion vote against it; and if it be resolved in the negative, the speaker is prevented from putting the main question, which, however, may be brought forward on another day. 4. By an amendment substituting words of an entirely different import for those of the motion, so that the sense of the house is taken on a totally different question.

When the question is put by the speaker in the lords, the respective parties exclaim "content" or "non-content;" in the commons, the expression used is "aye" or "no." The speaker signifies his opinion which party have the majority, and if the house acquiesce, the question is said to be resolved in the affirmative or negative; when his decision is disputed, the numbers must be counted by a division. Both houses now divide by the content or ayes going into the right lobby, and the non-contents or noes into the left, each being counted by tellers appointed by the speaker. In the house of commons, two clerks with printed lists of the members put a mark to the name of each as he re-enters the house, so as to secure accuracy in the division-lists. The speaker of the commons, who does not otherwise vote or take part in a debate, has a casting-vote in case of equality. In the house of lords, the speaker is, on the other hand, not disqualified from taking part in a debate; he votes on divisions, but has no casting-vote;

and on an equality, the non-contents prevail. The system of pairing commonly practiced, though never directly recognized by the house, enables members on opposite sides to absent themselves for a time agreed on, each neutralizing the votes of the other. A member of the upper house may, with leave of the house, by a protest enter his dissent from a vote of the house, and its grounds. Every protest is entered on the journals of the house, together with the names of all the lords who concur in it.

No question or bill is allowed to be offered in either house substantially the same with one on which the judgment of that house has already been expressed in the current session. A resolution of the house, however, may be rescinded, and an order discharged; and by 13 and 14 Vict. c. 21, it is provided that every act may be altered, amended, or repealed in the same session of parliament.

In debate, a member of the commons addresses the speaker; a member of the upper house the lords generally, in both cases standing and uncovered. No member may speak except when there is a question before the house, or with the view to propose a motion or amendment, the only admitted exceptions being in putting questions to ministers of the crown, or to members concerned in some business which is before the house, and in explaining personal matters. A member is not allowed to speak twice to the same question except in explanation, and the proposer, in some cases, in reply—a restriction which does not apply in committee. By the rules adopted by both houses for preserving order in debate, no allusion is allowed to debates of the same session on a question not under discussion, or to debates in the other house of parliament. All reflections on any determination of the house are prohibited, except when made with a view of moving that the determination be rescinded; so is the mention by a member of her majesty's name either irreverently, or to influence the debate, and the use of offensive and insulting words against parliament or either house, or a member of the house in which he is speaking. No member is allowed to refer to another by name, or otherwise than by the rank or office which he enjoys, or place which he represents. The speaker *naming* a member to the house, is an old established form of censure. New procedure rules were adopted, 1882, securing the right of deciding when the vote should be taken.

Messages.—It is often found necessary for the houses to communicate with each other regarding matters occurring in the course of business. Messages from the lords were formerly sent by masters in chancery or judges, while the commons sent a deputation of their own members. According to a new arrangement adopted in 1855, one of the clerks of either house may be the bearer of a message.

Committees.—Parliamentary committees are either "of the whole house," or "select." A committee of the whole house is the house itself, with a chairman instead of the speaker presiding. The chair is taken in the lords by the chairman of committees appointed at the beginning of each session, in the commons by the chairman of the committee of ways and means. Matters relating to religion, trade, the imposition of taxes, or the granting of public money, are generally considered in committee before legislation, as also are the provisions of any public bill. Proceedings are conducted nearly as when the house is sitting, the lords being addressed in the upper house, and in the lower the chairman, who has the same powers to maintain order as the speaker, and a casting vote in case of equality. In committees of the commons, as in the house itself, a quorum of forty members is required; but if that number are not present, the speaker must resume the chair to adjourn the house. A motion in committee need not be seconded, and there is a more unlimited power of debate than in the house, members being at liberty to speak any number of times on the same question. A motion for "the previous question" is not allowed. When the business of the committee is not concluded on the day of sitting, the house is resumed, and the chairman moves "that the house be again put into committee on a future day," in the lords, and in the commons reports progress, and asks leave to sit again.

Select committees are composed of a limited number of members appointed to inquire into any matter, and report. In the commons, it is usual to give select committees power to send for persons, papers, and records; in the lords, they may, without any special authority, summon witnesses. In neither house can a committee enforce the attendance of a witness; this must be done, when necessary, by the house itself. The commons have certain standing orders for insuring the efficiency of committees, and impartiality in their appointment. No committee is to consist of more than fifteen. Members moving for a committee must ascertain whether the members whom they propose to name will attend. Lists of the members serving on each committee are to be affixed in the committee clerk's office and the lobby. To every question asked of a witness, the name of the member who asks it is to be prefixed in the minutes of evidence laid before the house; and the names of the members present at each sitting, and, in the event of a division, the question proposed, the name of the proposer, and the votes of each member, are to be entered on the minutes, and reported to the house. In the lords there are no special rules regarding the appointment and constitution of committees; but resolutions containing arrangements similar to those of the commons regarding questions to witnesses, minutes of proceedings, and divisions, have been adopted since 1852. Select committees have the power of adjournment from time to time, and sometimes from place to place. By an anomaly not easily explained, the commons have always been considered not to have the power of administering oaths; a power of examining on

oath has, however, by statute been granted to election committees, and committees on private bills. In the house of lords, witnesses had formerly to attend at the bar of the house to be sworn; but the oath may now be administered by any committee of the house. Except where leave of absence has been obtained, no member, unless above the age of sixty, can excuse himself from serving on committees, or for not attending when his attendance has been made compulsory by order of the house. In committees on private bills in the commons, the chairman has a deliberative as well as a casting vote. Since 1864, joint committees of both houses, composed of an equal number of members of each, have occasionally been appointed.

Bills.—The principal business which occupies both houses is the passing of bills. In early times, laws were enacted in the form of petitions from the commons, which were entered on the rolls of parliament, with the king's answers subjoined; and at the close of the session, these imperfect records were drawn up in the form of a statute, which was entered on the statute rolls. It was found that, on undergoing this process, the acts passed by the parliament were often both added to and mutilated, and much of the legislative power practically came into the hands of the judges. Bills in the form of complete statutes were first introduced in the reign of Henry VI. Bills are either public or private; the former affect the general interests of the community, the latter relate to local matters. Public bills are introduced directly by members; private bills by petitions from the parties interested, presented by members. Bills may originate in either house; but the exclusive right of the commons to deal with all legislation regarding taxes or supplies, makes it necessary and expedient that by far the greater part of both public and private bills, except such as are of a purely personal nature, should originate in the lower house. Bills regarding restitution of honors originate in the house of lords. One description of act alone originates with the crown—an act of grace or pardon. It is read only once in each house, and cannot be amended, but must be accepted in the form in which it is received from the crown, or rejected.

Public Bills.—In the house of lords, any member may present a bill. In the commons, any member may move for leave to bring in a bill, except it be for imposing a tax, when an order of the house is required. When the motion is seconded and leave given, the mover and seconder are ordered to prepare and bring in the bill. Such bills, however, as relate to religion, trade, grants of public money, or taxation, are required to be introduced by the house itself, on a report of the committee of the whole house. A bill is drawn out on paper, with blanks or italics where any part is doubtful, or where sums have to be inserted. It is read a first time, and a day fixed for a second reading, allowing a sufficient interval to let it be printed and circulated. When ready, which is often as soon as the motion for leave to bring it in has been agreed to, it is presented at the bar by one of the members who were ordered to prepare and bring it in, and afterwards, on an intimation from the speaker, brought up to the table. The question is put, "that the bill be now read a first time," which is rarely objected to; and in the commons can only be opposed by a division. The short title of the bill, as entered in the orders of the day and indorsed on the bill, is then read aloud, which is accounted sufficient compliance with the order of the house. A day is then appointed for considering the question, "that the bill be read a second time," allowing a sufficient interval to elapse to let it be printed and circulated. At the second reading the member in charge of the bill moves "that the bill be now read a second time." This is the usual time for opposing a bill whose general principle is disapproved. This is done by an amendment to the question, by leaving out the word "now," and adding "this day three months," "this day six months," or some other time beyond the probable duration of the session. Counsel are sometimes allowed to plead at the second reading or other stages. If the bill be approved on the second reading, it is committed, either to a select committee, or to a committee of the whole house, to consider its provisions in detail. When the proceedings in committee are terminated, the bill is reported to the house with amendments, which may be agreed to, amended, or disagreed to. It is then ordered to be read a third time, when the entire measure is reviewed. No amendments, except what are verbal, can then be made, and the question is put to the house, "That this bill do now pass." The title of the bill is last settled. The bill, when passed by the commons, is sent to the lords, where it goes through the same forms: if rejected, no further notice is taken of it; if passed, a message is sent to the commons that the bill is agreed to. If amendments have been made, they are sent down along with the bill to be discussed by the commons; and if they are not agreed to, a conference is demanded by the commons, to offer reasons for disagreeing to the amendments. A conference is a mode of communicating on important matters between the houses, in which each house is brought into direct contact with the other by a deputation of its own members—the time and place of meeting being always fixed by the lords. A conference is conducted, for both houses, by managers, who, on the part of the house desiring the conference (in the case supposed, the commons), consist of the members who have drawn up the reasons, with others sometimes added. If the lords be not satisfied with the reasons offered, a second conference is desired, after which what is called a "free conference" may be demanded, in which the managers have more discretion vested in them to advance what arguments they please. No free conference has been held since 1740. By resolutions of both houses, agreed to in 1851, reasons for disagreement from amendments may be

communicated by messages without a conference, unless the other house should desire a conference; and since that time there has been but one instance of a conference where a message would have been available. If the commons eventually agree to the amendments, the bill is sent back to the lords; if not, it is dropped. The same forms are gone through when a bill originates in the house of lords. The official record of the assent of one house to the bills passed, or amendments made by the other, is an indorsement on the bill in Norman French. Thus, when a bill is passed by the commons, the clerk of the house writes on the top of it, "Soit bailé aux seignieurs." When the lords make amendment to a bill, it is returned with the indorsement, "A ceste bille avesque des amendments les seignieurs sont assentus." When it is sent back with these amendments agreed to, the clerk of the house of commons writes, "A ces amendments les communes sont assentus." When both houses have agreed to a bill, it is deposited in the house of lords, to await the royal assent, unless it be a money-bill, which is sent back to the commons.

Private Bills.—In private bills, the functions of parliament partake of the judicial as well as the legislative character, and the difficulties of reconciling the interests of the public and of individuals often give rise to inquiries too extensive for the house to undertake, which therefore delegates them to committees. The standing orders require certain notices to be given to parties interested by personal service, and to the public by advertisement. The practice in both houses now is for all petitions for private bills to be referred to four "examiners," two from the lords and two from the commons, whose duty it is to examine whether certain notices and other forms required by the standing orders of the house have been complied with. If the report be favorable, leave is given to bring in the bill; if unfavorable, it is referred to a committee, called the committee on standing orders, who report on the propriety of relaxing the standing orders in this individual case—should they report unfavorably, it is still in the power of the house to relax the standing orders, though this is rarely done. Three days must elapse between the first and second reading. At the second reading, the principle is considered, as in the case of public bills; and if the bill be carried, it is referred, if not a railway, canal, or divorce bill, to the "committee of selection," consisting of the chairman of the standing orders committee, and five other members nominated at the beginning of the session, whose functions are to classify the bills, to nominate the committees on them, and to arrange their time of sitting. A railway or canal bill is referred to the "general committee of railway and canal bills." This committee forms bills of this class into groups, and appoints the chairman of the committee which is to sit on each bill from its own body, the remaining members, four in number, being chosen from the committee of selection. Before the sitting of the committee, every private bill, whether opposed or unopposed, must be examined by the chairman of the committee of ways and means and his council. It is also laid before the chairman of the lords' committee and his council, and effect is given to their observations, a proceeding which greatly facilitates the after-progress of the bill in the house of lords. The board of trade, the secretary of state for the home department, the lords' commissioners of the admiralty, and the commissioners of woods and forests, also exercise a supervision over private bills of various kinds, by which the respective rights of their departments may be supposed to be encroached on. In the house of lords, estate bills are referred to the judges. Every bill, at the first reading, is referred to the examiners, before whom compliance with such standing orders as have not been previously inquired into must be proved. The standing orders committee of the lords is now assimilated in functions to that of the commons. The bill is returned to the commons either with amendments, or with a message that it is agreed to without amendments. In case of disagreement between the houses, the same forms are observed as in public bills.

In recent times, the necessity for obtaining private acts has been, in many cases, obviated by general laws adapted to different classes of objects, of which parties are enabled to avail themselves, instead of applying to parliament for special powers.

Royal Assent.—A bill becomes a statute or act of parliament on receiving the royal assent, which is given in the house of lords, the commons being also present at the bar. It is given in either of two ways: by letters-patent under the great seal, signed by the sovereign's own hand, and communicated to the two houses by commissioners; or by the sovereign present in person in the house of lords. When the royal assent is given by commission, three or more of the lords commissioners command black rod to signify to the commons that their attendance is desired, on which the commons, with the speaker, immediately come to the bar. The commission is then read at length; and the titles of all the bills being read by the clerk of the crown, the royal assent to each is signified by the clerk of the parliaments in Norman French, and so entered on the lords' journals. In assenting to a public bill, the words used are: "Le roy [la reyne] le veult;" to a private bill, "Soit fait comme il est desiré;" and to a bill of supply (which is presented by the speaker, and receives the royal assent before all other bills); "Le roy remercie ses bons sujets, accepte leur benevolence, et ainsi le veult." In the case of an act of grace, which has originated with the crown, there was, till lately, no further expression of the royal assent; but the clerk of the parliaments, having read its title, said: "Les prélats, seigneurs, et communes en ce présent parliament assemblés, au nom de tous vos auctres sujets, remercient très-humblement vostre Majesté, et prient à Dieu

vos donner en santé, bonne vie et longue:" the royal assent, however, has been latterly given to acts of grace in the usual form. The refusal of the royal assent is announced by the words, "Le roy s'avisera." But the necessity for such refusal is generally removed by the observance of the constitutional principle, that the queen has no will but that of her ministers, who only continue in office so long as they have the confidence of parliament. The last instance in which the royal assent was refused was by queen Anne in 1707, regarding a bill for settling the militia in Scotland.

The royal assent is seldom given in person, except at the close of a session, when the queen attends to prorogue parliament, and then signifies her assent to such bills as have been passed since the last commission was issued; but bills providing for the honor and dignity of the crown, and bills for settling the civil lists, have generally been assented to by the sovereign in person, immediately after they have passed both houses. When the royal assent is given in person, the clerk of the crown reads the titles of the bill; and the clerk of the parliaments, who has previously received her majesty's commands in the robing-room, makes an obeisance to the throne, and signifies her majesty's assent, as already described, the queen giving a gentle inclination.

Supplies.—Prior to 1688, in addition to parliamentary taxation, imposts were sometimes levied by an exercise of the royal prerogative. Since the revolution, no taxes have been raised otherwise than by parliamentary authority. The commons have the exclusive right to impose taxes and vote money for the public service. The lords cannot even make an alteration in a bill of supply, except to correct a clerical error. The lords are not even entitled to insert in a bill any pecuniary penalties, or to alter the amount or application of any penalty imposed by the commons; a rule whose rigid assertion has been found to be attended with so much inconvenience that there has latterly been a disposition to relax it. If a bill containing provisions which make a pecuniary charge on the public originate in the lords, any such provisions are struck out in the bill as sent to the commons. In the commons, these provisions are printed in red ink, and supposed to be blank, and may be agreed to in committee. But though the commons has the exclusive right to grant supplies, a grant requires the ultimate assent of the queen and the house of lords.

The public revenue of the crown is derived in part from permanent charges on the consolidated fund, and in part from actual grants for specific public services, which require the yearly sanction of parliament. On the opening of parliament the queen demands from the commons the annual provision for the public services, and directs estimates to be laid before them. On agreeing to the address in answer to the royal speech, the commons order the speech to be taken into consideration on another day. On the arrival of that day a motion is made: "That a supply be granted to her majesty," and the house resolves itself into a committee to consider that motion. On the day appointed, the committee sits and agrees that a supply be granted, which, being reported, is agreed to by the house. The house then appoints another day on which it resolves itself into a "committee of supply." The estimates for the army, navy, and ordnance departments, are first laid before the committee; then the estimates for civil services, known as the miscellaneous estimates. The first business of the committee of supply is to elect a chairman, who is known as the chairman of the committee of ways and means, over which he also presides. When the first report of the committee of supply has been received and agreed to, a day is appointed for the house to resolve itself into a "committee of ways and means." This committee is not appointed till a sum has been voted by the house, nor is it afterward allowed to vote in excess of the expenditure voted by the committee of supply. It is the function of the committee of supply to consider what specific grants are to be voted, and of the committee of ways and means to determine how the funds shall be raised which are voted by the committee of supply. Without special parliamentary authority, the consolidated fund could not be applied to meet the supplies voted for the service of the year; but to make it so available, the committee of ways and means votes general grants from time to time out of the consolidated fund "toward making good the supply granted to her majesty;" and bills are founded on the resolutions of the committee, by which the treasury receives authority to issue the requisite amount from the consolidated fund for the service of the year. It belongs to the committee of ways and means to determine what sums shall be raised by exchequer bills in anticipation of the annual revenue, to make up the supply granted to her majesty. When the committee of supply has determined the number of men that shall be maintained during the year for the army and sea-service, and its resolutions have been agreed to, the *mutiny bill* and *marine mutiny bill* are brought in, providing respectively for the discipline of the troops and marines when on shore. Apart from this annual sanction, the maintenance of a standing army in time of peace would be illegal, and the army and marines would be relieved from all martial discipline. The committee of ways and means receives the annual financial statement from the chancellor of the exchequer, popularly called the *budget*. That minister gives a general view of the resources of the country, and of the financial policy of the government, and presents a probable estimate of income and expenditure for the twelve months ending on the 12th of April of the following year. He states what taxes he intends to reduce, and what new ones he means to impose, and ends by proposing resolutions for the adoption of the committee, which, when reported to the house, form the groundwork of bills for accomplishing the finan-

cial objects proposed. The charges for collecting the revenue, have, since 1854, been brought under the supervision of the house of commons; and estimates are voted for the revenue departments. A new tax cannot be proposed except by a minister of the crown. The resolutions of committees of supply and of ways and means are reported on a day appointed by the house, and read a first time without a question, and a second time on a question put from the chair, and are agreed to by the house, or may be disagreed to, amended, postponed, or recommitted. When the committee of supply is closed, the committee of ways and means authorizes the application of money from the consolidated fund, the surplus of ways and means, and sums in the exchequer, to meet the grant and services of the year, and the resolutions of the committee are carried into effect by the consolidated fund bill, or as it is often called, the *appropriation bill*. By a standing order of April 3, 1862, a standing committee of public accounts is appointed at the beginning of each session to examine into the appropriation of the sums granted by parliament to meet the public expenditure. Taxes of a permanent and general character are not now considered in the committee of ways and means.

Petitions.—Among the duties of parliament is the receiving of petitions. A petition must be presented by a member of the house to which it is addressed. Petitions from the corporation of London are, however, presented to the house of commons by the sheriffs at the bar, or by one sheriff, if the other be a member of the house, or unavoidably absent. In 1840, a petition was allowed to be presented by the lord mayor and aldermen, when the sheriffs were in custody of the sergeant-at-arms. The lord mayor of Dublin has been allowed to present a petition at the bar of the house, and the same privilege would probably be conceded to the lord provost of Edinburgh. Petitions which violate any of the rules of the house, are not brought up, but returned to the petitioners; and if an irregularity be discovered after a petition is brought up, its presentation is not recorded in the votes. In the house of lords, when a petition is laid on the table, an entry is made in the lords' minutes, and afterward in the journals of the house, which, however, does not describe its nature and substance. A petition may, on presentation, be made a subject of debate, but unless this is done, there remains no public record of its import, or of the parties by whom it was signed. In the house of commons, according to standing orders adopted in 1842, the member presenting a petition is to confine himself to a statement of who the petitioners are, the number of signatures, the material allegations of the petition and its prayer. In case of urgency, or where questions of privilege are involved, the matter of the petition may be discussed; but in ordinary cases no debate is allowed, and it is referred to the committee on public petitions, and if relating to a subject with regard to which the member presenting it has given notice of a motion, it may be ordered to be printed with the votes. The reports of the committee on public petitions are printed twice a week, and point out the name, the subject, and the number of signatures of each petition, and the total number of signatures, and petitions relating to each subject; and, in some cases, the petition itself is printed at full length in the appendix.

Communications with the Crown.—Besides at the opening and proroguing of parliament, and giving of the royal assent, there are other occasions on which the crown communicates with parliament by a *message*, under the sign-manual, to either house singly, or both houses separately. Messages are brought by a member of the house, being a minister of the crown, or one of the royal household, and may relate to important public events, the prerogatives or property of the crown, provision for the royal family, etc. An *address* is the mode in which the resolutions of parliament are communicated to the crown. Addresses may be joint, of both houses, or separate, of either house.

Returns.—Each house has the power of ordering returns from all those public departments which are connected with the revenue, under control of the treasury, or regulated by statute; but returns of matters connected with the exercise of royal prerogative, as from public departments subject to her majesty's secretaries of state, are obtained by means of addresses to the crown. A return is not allowed to be ordered in one house regarding the proceedings of the other; when such return is wished, it is usual to make an arrangement by which it is moved in the house to whose proceedings it relates, and after it has been presented, a message is sent to request that it may be communicated. Returns cannot be moved from private associations, or persons not exercising public functions; and the papers and correspondence sought from government departments must be of an official, not a private or confidential description. This rule was, under special circumstances, departed from in 1858, in regard to the opinion of the law-officers of the crown in the case of the *Cagliari*. Accounts and papers presented are ordered to lie on the table, and when necessary, ordered to be printed, or in the commons referred to the printing committee appointed at the beginning of each session.

Election Petitions.—Until 1770 all questions regarding controverted elections were decided by the whole house; the Grenville act of that year introduced the practice of appointing committees for their trial, and the proceedings of election committees were further regulated by 11 and 12 Vict. c. 98. By the "parliamentary elections act, 1868" (31 and 32 Vict. c. 124), election petitions are now presented to the court of common pleas in Westminster or Dublin, or the court of session in Scotland, and tried by a single judge appointed by the court, and sitting in the borough or county whose election is contested. An election petition must be signed by some person who voted, or had a

right to vote at the election, or by some person who claims to be returned, or alleges himself to have been a candidate, and presented within 21 days after the return objected to, or, if it proceeds on the allegation of bribery, within 28 days after the alleged payment. Security is to be found for costs to the extent of £1000, either by sureties not exceeding four, or by a deposit of money, or partly in each way. The judge determines whether the member was duly elected, and certifies to the speaker his determination, which is final. Should the petition allege corrupt practices, the judge shall also report to the speaker whether there has been any corrupt practice within the knowledge and consent of any candidate, the names of persons proved guilty, and whether corrupt practices have prevailed extensively at the election; also the judge may specially report any matter for consideration of the house of commons. Where, on application of any party to a petition, it appears that the case raised can be conveniently stated as a special case, it may be so stated and determined by the court, who certify their decision to the speaker, which is final. An election petition cannot be withdrawn without leave of the court or judge on special application; and a person who might have been a petitioner may apply to be substituted for the person withdrawn. The court or judge is to report to the speaker whether in their opinion the withdrawal of the petition has been induced by any corrupt arrangement. The most frequent subjects of special reports are bribery, treating, and the use of undue influence, matters regarding which, prior to 1868, various acts had been passed, the most important being 17 and 18 Vict. c. 102 (1854), 21 and 22 Vict. c. 87 (1858), and 26 Vict. c. 29 (1863), three statutes known as the "corrupt practices prevention acts." By the act of 1868, a candidate convicted of bribery is punished by voidance of his election, incapacity during 7 years to be elected or to vote, to hold any office under 5 and 6 Will. IV. c. 76, or 3 and 4 Vict. c. 108, or any municipal or judicial office, or to act as justice of the peace; and the same disqualifications to vote, to be elected, and to hold office, are incurred by any person other than a candidate found guilty of bribery. If a candidate is proved to have knowingly engaged as canvasser or election-agent a person found guilty within the previous seven years of any corrupt practice, his election is void. Act 15 and 16 Vict. c. 57 enacts that upon the joint address of both houses of parliament, representing to her majesty that a committee of the house of commons has reported that corrupt practices have extensively prevailed at any election, her majesty may appoint commissioners to make inquiry; and by the act of 1868, the judge's report to the effect that corrupt practices have prevailed, or that there is reason to believe they have prevailed, is to be accounted equivalent to the report of the house of commons' committee to that effect under the previous act. It is further provided by the act of 1868 that within 21 days of the return to the clerk of the crown, or within 14 days after the meeting of parliament, a petition may be presented by any two electors, alleging that corrupt practices have extensively prevailed at their last election, or that there is reason to believe this to have been the case. If, on such petition, an address by both houses of parliament be presented to the crown, praying for inquiry into such allegation, the crown may appoint commissioners to inquire, with the powers and subject to the provisions of act 15 and 16 Vict. c. 57.

By the act of 1854, the offering of money, office, employment, etc., to a voter to induce him to vote or abstain from voting, or the offering of a similar consideration to any person to induce him to procure the return of a candidate or the vote of an elector, the acceptance of such consideration, and the payment of money in the knowledge that it is to be expended in bribery, or the repayment of money which has been spent in bribery, are all declared to be acts of *bribery* punishable by fine and imprisonment, as well as by the forfeiture of £100 with costs to any person who will sue for the same. Any voter who agrees to receive money, office, or employment for voting or abstaining from voting, and any person who, after an election, receives money or other consideration on account of any person having voted or refrained from voting, is also guilty of bribery, and liable to forfeit £10 with costs to any one who will sue for the same. *Treating*, which is defined as the providing of meat, drink, or other entertainment to any person in order to be elected, or in consideration for any person voting or abstaining from voting, involves a penalty of £50 similarly recoverable, as also does *undue influence*, or interference by intimidation, abduction, or otherwise, with the freedom of electors. Persons guilty of any of these offenses are, by the provisions of the same acts, to be struck off the register, and their names inserted in a separate "list of persons disqualified for bribery, treatment, and undue influence," which is to be appended to the register of voters. Cockades are prohibited, as is the furnishing of refreshment on the day of election to a voter in consideration of his being about to vote. By the corrupt practices act, 1854, it is however declared lawful to provide a conveyance for a voter, though not to pay him a sum of money for traveling expenses. By the act of 1863, no payment is allowed to be made on behalf of a candidate except through his authorized agent, and all claims against a candidate in respect of an election must be settled within a month, otherwise the right to recover them is barred. A detailed account of election expenses with vouchers is required to be delivered within two months of the election to the returning officers, by whom it is published in a local newspaper, and the vouchers are to be open for a month to the inspection of voters. The act of 1863 provides that when an election committee has reported that certain persons named have been guilty of bribery, and their report is confirmed by a commission of inquiry, such report, with the evidence

taken, is to be laid before the attorney-general with the view of instituting a prosecution.

Impeachment.—There are instances, as far back as the times of the Plantagenet princes, of the supreme power of parliament being exercised to punish offenses where something extraordinary in the nature, or some unforeseen obstacle to the execution of the ordinary laws, was deemed to render this advisable. This was done by a bill of attainder, which in the reign of Henry VIII. became the usual mode of proceeding against state offenses. A bill of attainder sometimes followed a regular trial and conviction, as in the case of Empson and Dudley, but was often passed without trial, examination of witnesses, or hearing the accused party, as in the attainder of Fisher and sir Thomas More. Bills of attainder were sometimes, but rarely, had recourse to under the Stuart kings; the last instance was the case of sir John Fenwick, in 1696. The practice of impeachment of extraordinary offenders before the lords by the commons, which had been frequent during the 14th and 15th centuries, was revived in the reign of James I. This proceeding is not like bills of attainder or pains and penalties, the making of a new law *pro re nata*, but a carrying out of the already known and established law. The great representative inquest of the nation first find the crime, and then as prosecutors support the charge before the highest court of criminal jurisdiction. It has always been allowed that a peer may be impeached for any crime whether cognizable by the ordinary courts or not. The right of the commons to impeach a commoner of a capital offense, which was at one time doubted, has been solemnly affirmed by the house of lords. The trial is conducted by managers for the commons. Witnesses are summoned by the lords at the desire of the commons, and Westminster hall has usually been the place of trial, the lord high steward presiding. The managers make their charges and adduce evidence; the accused answers, and may defend himself by counsel; and the managers have a right to reply. In giving judgment, the question is put by the lord high steward to each peer, beginning with the junior baron, on each article separately, whether the accused be guilty. The answer is, "guilty, on my honor," or "not guilty, on my honor," the lord high steward giving his opinion the last, and the numbers being cast up, the accused is aquainted with the result. Impeachments have not been common in later times, though they are still a competent proceeding; the latest memorable cases are those of Warren Hastings in 1788, and lord Melville in 1805.

Trial of Peers.—Peers are, in all cases, tried by their peers for treason, misprision of treason, felony, or misprision of felony. For misdemeanors, however, they are tried before the ordinary courts of law; and the lords spiritual are in all cases tried before the ordinary courts of the country. During the sitting of parliament, the trial proceeds before the house of lords, or more properly before the court of parliament presided over by the lord high steward. When parliament is not sitting, the trial takes place before the court of the lord high steward—a tribunal whose constitution was at one time very objectionable, that officer being allowed to summon what peers he pleased, only with the proviso that the number should amount in all to 23. Act 7 Will. III. c. 3 requires that all the peers who have a right to sit and vote in parliament be summoned. Peers of Scotland and Ireland are, in terms of the acts of union, tried in the same way. By 4 and 5 Vict. c. 22, a peer is liable on conviction to the same punishment as any other of the lieges.

See sir T. Erskine May's *Laws, Privileges, Proceedings, and Usage of Parliament*, 7th edition, 1873; Lucy's *Parliamentary Procedure*, etc.

PARLIAMENTARY LAW. The course of procedure, rules of order, and customs of debate in American organized conventions, legislative bodies, and societies, are those laid down in the manual arranged by Thomas Jefferson, while he was president of the U. S. senate; and in the *Law and Practice of Legislative Assemblies*, by Mr. L. S. Cushing. But the foundation of both these works, and of the methods in vogue under their suggestion, has been the law of parliament. See PARLIAMENT. And this applies equally to all voluntary and temporary organizations in America, to local and business corporations, and to political meetings; excepting, as regard the parliamentary origin of rules of order and the business of public meetings, when these have been specifically altered by the laws and customs of congress, which may be considered as the immediate fountain-head of all such rules and business in American assemblies. Public meetings are usually organized at first temporarily, and the details of permanent organization left to a committee appointed by the temporary chairman. It is a common practice in such cases to elect more than one vice-president, and several secretaries; these offices being, however, usually honorary. In certain legislative bodies in the United States, and notably in the U.S. senate, and in the upper house in some of the states, the presiding officer is not a member of the organization. A quorum of members is always required for the transaction of business, and if the number necessary to a quorum be not fixed by law, it is always a majority of the members. Business is entertained as being before the house, when a member is recognized by the chairman as having offered a motion, or when a communication is acknowledged by the same officer and laid before the meeting; provided that in the case of a motion it be seconded by a member other than the one offering it. Motions to lay on the table, and for the previous question, are customary methods in use to dispose of questions and to cut off debate. It requires a two-thirds vote to suppress a question without permitting any debate. A motion to

reconsider a question which has been decided, can only be made by one who has voted affirmatively; in congress this can be done on the day following that of the original action on the question. A motion to adjourn, when unqualified, is always in order, provided there has been debate on any question since its last previous offer. A rule adopted must be enforced by the chair without question, though a motion to suspend the rules gives temporary priority to the question in behalf of which such action is taken, provided that the motion be sustained by a two-thirds vote. On an appeal against a decision of the chairman, the latter is permitted to speak without leaving the chair, a course which is not permitted under other circumstances. Debate must be confined to the question, the chairman being addressed, and personalities being out of order. Motions which are undebatable are the following: to reconsider, where the question is undebatable; the previous question; to lay on and take from the table; an objection to consideration of any question; an appeal, provided it shall relate to transgression of the rules, or to indecorum; questions relating either to priority of business, to withdrawing a motion, to reading papers, or to suspending the rules; a call for the order of the day; a motion to adjourn, when unqualified; to fix a time to which to adjourn; and a motion to postpone indefinitely. None of these motions can be amended, excepting that to fix the time to which to adjourn. Precedence to motions is given in the following order; and any motion, except to amend, can be made while one of a lower order is pending, but none can supersede one of a higher order: to fix the time to which to adjourn; to adjourn, when unqualified; a call for the order of the day; to lay on the table; the previous question; to postpone to a certain time; to commit, amend, or postpone indefinitely. It is usual in all deliberative assemblies to simplify their business by referring questions requiring investigation or testimony, to committees appointed for the purpose. Sometimes such committees are appointed by the chair, at others they are elected by the members. On occasions when the assembly resolves itself into a committee of the whole, for the consideration of any special question, the chair appoints a presiding officer, or he may be elected by the committee. The course of a bill through congress, involves its introduction into the senate or the house of representatives, on the report of a committee, or on motion for leave to introduce by a member who shall have previously given at least one day's notice of his intention. It is then, unless otherwise specially ordered, read three times on three different days; the merits of the bill being usually discussed after the second reading, which generally immediately follows the first, on an accepted theory that the second reading is by special order. If ordered to be engrossed, a day is appointed for the third reading, and after this reading the question is on the final passage of the bill. Commonly the second and third readings are held to mean only the reading of the title of the bill. On the passage of the bill in one house, it is certified by the clerk and sent to the other; upon passing which, it is enrolled on parchment, examined by a committee of two from each house, signed by the speaker of the house and the president of the senate, presented to the president of the United States, and on receiving his signature becomes a law. If it is vetoed, it may be still made a law on receiving a two-thirds vote in each house, and if not returned by the president within ten days after its receipt by him (Sundays excepted) it becomes a law without his approval. A similar mode of procedure in the case of bills generally obtains in the state legislatures. Societies and voluntary organizations of all classes in the United States, usually have their constitution, by-laws, and rules of order, as adopted after full discussion, printed, or engrossed, and conveniently placed for the information of the members. But these, except in minor points of detail, are usually made to conform to Jefferson's and Cushing's manuals, to which the reader is referred for further information.

PARLOA, Maria, appeared as a lecturer on cookery in Boston in 1877; she opened a cooking-school, which was fully attended by public and private classes; was special instructor or lecturer, at various seminaries in Mass. and N. H., and gave courses of lessons in sick-room cookery to Harvard medical students; instructed normal classes of teachers for cooking-schools; gave free instruction at evening mission schools. In 1878 Miss P. visited Paris for study. In 1881 she lectured in western cities, and in 1882 she opened her very prosperous cooking-school in New York city. She has published: *The Appledore Cook-Book*, 1872; *Camp Cookery*, 1878; *First Principles of Household Management and Cookery*, 1879; and *Miss Parloa's New Cook Book and Marketing Guide*, 1882.

PARMA, a former sovereignty of upper Italy, having the rank of a duchy, and bounded on the n. by Lombardy and Venice, e. by Modena, s. by Genoa and Tuscany, and w. by Piedmont, consisted of the duchies of Parma and Piacenza, which were subdivided into 5 districts, and contained in all 2,268 English sq.m., with a pop. (1871) of 490,259. The Apennines, which cross the southern division of the duchies, send off spurs northwards, and give to the northern part of the country the character of a plain, gently undulating, but sloping uniformly to the Po, which is the recipient of all the rivers of the country. The highest peaks of the Apennines in Parma are Monte Alpe di Succisio, about 7,000 ft.; and Monte Parma and Monte Orsajo, both more than 5,250. The mountain-range is richly clad with oak and chestnut forests. The plain, which is very fertile, produces rich crops of grain (including rice), leguminous plants, fruits of all kinds, olives, and grapes; while marble, alabaster, salt, and petroleum are the chief mineral products. Next to agriculture, the production and manufacture of silk, the rearing of cattle and poultry, cheese-making and the extraction of the mineral products, afford the chief employment. Silk and cheese are the chief exports.

The form of government was monarchical, and the Roman Catholic religion the only one tolerated, though a few Jews are found here and there through the country. The condition of education, though improved of late, is still very defective. The administrative power was in the hands of a council of state, which was divided into two sections—one for internal administration, which acted as a court of final appeal in matters of justice, the other for finance and military and foreign affairs. The revenue of Parma in 1859 was estimated at 11,566,648 liras ($2,290,425), and the expenditure at 11,273,883 liras ($2,232,450). The total debt, funded and redeemable, amounted to 15,558,218 liras ($3,080,835). The army (1859) before the annexation, according to the statistics of 1863, consisted of 3,290 soldiers; the duke had also the occasional loan of an Austrian regiment, and the fortress of Piacenza was garrisoned by the troops of that power.

History.—Parma and Piacenza belonged in the time of the Roman empire to Cisalpine Gaul, and after its fall came under the rule of the Lombards, to whose rule succeeded that of the kings of Italy and the German emperors. In the 12th and following centuries, they joined the other territories of northern Italy which were struggling for liberty and independence, and consequently became involved in the Guelph and Ghibelline contests. Weakened by these strifes, they fell under the domination of the powerful houses of Este, Visconti, and Sforza; but in 1499 they passed under the yoke of the French monarch, Louis XII., from whom they were soon recovered by the emperor Maximilian, and handed over to pope Leo X. in 1513. They continued under the sovereignty of the popes till 1543, when they were alienated by pope Paul III., and with the surrounding territory were erected into a duchy for his natural son Pier-Luigi Farnese, the grandfather of Alessandro Farnese, the celebrated regent of the Low Countries. On the extinction of the male line of Farnese, in 1731, by the death of the eighth duke, Antonio, his niece Elizabeth, the queen of Philip V. of Spain, obtained the duchies for her son Don Carlos, who, however, exchanged them in 1735 with Austria for the throne of the two Sicilies. In 1748 they were restored along with Guastalla to Spain, and became a duchy for the infante Don Philip, with a reversion to Austria in case of the failure of his male descendants, or of any of them ascending the Spanish or Neapolitan throne. Philip was succeeded in 1765 by his son Ferdinand, who was an able and enlightened ruler, and expelled the Jesuits in 1768. He died in 1802, and his dominions were immediately taken possession of by the French, and were incorporated with France under the designation of the department of Taro in 1805. In 1814, by the treaty of Paris, Parma, Piacenza, and Guastalla were presented as a sovereign duchy to the empress Maria Louisa, a proceeding strongly opposed by the king of Spain, who demanded them for his sister, Maria Louisa, the widow of Louis, king of Etruria, the son of duke Ferdinand. However, in 1817, it was settled that Maria Louisa of Austria should possess the duchies, and that on her death they should descend to Ferdinand Charles, duke of Lucca, the son of Maria Louisa of Spain, and the rightful heir; and on failure of his heirs, Parma should revert to Austria, and Piacenza to Sardinia. The empress governed very much after the Austrian fashion, but with gentleness, though liberal sentiments were looked upon by her with little favor. On her death, in 1847, the duke of Lucca succeeded as Charles II., and certain exchanges of territory, previously settled by the great powers, took place with Tuscany and Modena—the chief of which being the transfer of Guastalla to Modena in exchange for the districts of Villa-franca, Treschietto, Castevoli, and Melazzo, all in Massa-Carrara, resulting in a loss to Parma of about 77 English sq.m. of territory, and a gain of 193 English sq. miles. This transfer was not made without great discontent on the part of the inhabitants. The duke's rule was severe and tyrannical, and on an address being presented to him with a view of obtaining a reform of certain abuses, and a more liberal political constitution, similar to what Tuscany had (Feb., 1848), obtained from its grand-duke, he threw himself into the arms of Austria, and consented to the occupation of his territory by Austrian troops. In March, 1848, a revolution broke out, and the duke was compelled to grant the popular demands, but he almost immediately after retired from the country. Parma joined with Sardinia in the war of 1848–49 against Austria, but on the triumph of the latter power was compelled to receive Charles III. (his father, Charles II., having resigned his throne, March, 1849) as its ruler. The new duke recalled the constitution which his father had been compelled to grant, and punished with great severity the active agents of the revolutionary movements in his dominions. His arbitary measures were effectively seconded by his chief minister, an Englishman named Ward, who shared the public obloquy with his master. After Charles III.'s assassination in March, 1854, his widow Louise-Marie-Therese de Bourbon, daughter of the last duke of Berry (q.v.), assumed the government for the behoof of her son Robert I., and made some attempts at political reform; but owing to the excited state of the people they were little effective, and she and her son were compelled to leave the country in 1859, on the outbreak of a new war between Sardinia and Austria. In March 18th of the following year the country was annexed to Sardinia, and it now forms a part of the kingdom of Italy, constituting the two provinces of Parma (area 1250 English sq. m.; pop. '95, 273,331, est.) and Piacenza (area 954 English sq. m., pop. '95, 229,713, est.), a few of the outlying districts, amounting to about 150 sq. m., being incorporated with other provinces.—*Official Statistics of the Kingdom of Italy* (Turin, 1861); *Budget of the Æmilias; Report of the Marquis Pepoli to the Minister of Finances* (Turin, 1860); *idem. Report of General Tozze to the Minister of War* (1863).

PARMA, the capital of the province of the same name in Italy, and formerly the capital of the duchy of Parma, is situated on both sides of the river Parma, 12 m. s. from the Po, 75 m. s.e. from Milan, and about the same distance e.n.e. from Genoa, with a pop. '92 of 51,500.

The town is of a circular form, and is surrounded by walls and ditches flanked by bastions; the streets are straight and wide, and meet at right angles, the chief of them, a part of the Roman Via Æmilia, crossing the city from e. to w., and dividing it into two nearly equal parts. Parma is celebrated for its churches, 10 in number, the chief of which are the *Duomo*, or cathedral (consecrated 1106 A.D.), built chiefly in the Lombard style, having the interior adorned with magnificent frescoes by Correggio, and paintings by other artists, and surmounted by a beautiful dome; the *Battisterio*, or Baptistery, one of the most splendid in Italy, begun in 1196 and completed in 1281; the church of the *Madonna della Steccata*, containing the famous painting of "Moses breaking the Tables of the Law" by Parmigianino. The other celebrated buildings are, the Farnese palace, a gloomy and ill-constructed edifice; the Farnese theater, built (1618–28) of wood, and now in a most dilapidated condition. Parma has also a library containing 150,000 volumes, mostly well selected, and many of them rare and valuable works; a museum of antiquities; a botanic garden; a theater (*Teatro Nuovo*); an academy of fine arts, founded in 1752, possessing a collection of 600 pictures, many of which are exceedingly valuable. The pictures most highly esteemed are the "Madonnas" of Correggio and Francia, the "St. Jerome" of Correggio, and the "Jesus Glorified" of Raphael.

PARMA, BATTLES OF. An indecisive engagement took place here June 29, 1734, between the confederated armies of England, France, and Spain, and the Austrians; and on June 19, 1799, the French under Macdonald were routed by the Russians under Suwarof, with a loss of 10,000 men and 4 generals.

PARMA, DUKE OF. See FARNESE.

PARMENIDÉS, a Greek philosopher of Elea, in lower Italy, and in the opinion of the ancients the greatest member of the Eleatic school, flourished about the middle of the 5th c. B.C. Nothing is known with certainty regarding his life, but he is said to have visited Athens in his old age, and to have conversed with Socrates, then quite a youth. The story, though it rests on the authority of Plato, has a suspicious air, and seems as if it were intended to account for the influence which the philosophy of Parmenides undoubtedly exercised on that of Socrates and Plato themselves. Parmenides, like Xenophanes of Colophon, sometimes regarded as the first of the Eleatics, expounded his philosophy in verse—his only work being a didactic poem *On Nature*. The leading design of this poem is to demonstrate the reality of absolute being, the non-existence of which Parmenides declares to be inconceivable, but the nature of which, on the other hand, he admits to be equally inconceivable, inasmuch as it is dissociated from every limitation under which man thinks. Parmenides is not a theologist in speculation, seeking rather to identify his "Absolute Being" with "Thought" than with a "Deity." Only fragments of his poem remain, which have been separately edited by Fülleborn (Züllichau, 1795); another collection is that by Brandis, in his *Commentatiönes Eleaticæ* (Altona, 1815); but the best is to be found in Karsten's *Philosophorum Græcorum veterum Reliquiæ* (Amstelod. 1835).

PARMER, a co. in the 'Panhandle" of Texas, with New Mexico as its w. boundary: formed, 1876; 850 sq.m.; pop. '90, 7; unorganized.

PARMIGIANO, GIROLAMO FRANCESCO MARIA MAZZOLA, called Parmigiano or Parmigianino, b. at Parmo in 1504, an able painter of the Lombard school, and the most distinguished of those who followed the style of Correggio. His pictures attracted much attention when he was little more than 14 years of age. In 1523 he went to Rome to follow out his studies, and was soon favorably noticed and employed by Clement VII. He was in that city when it was stormed by the imperialists under Bourbon in 1527, and, it is said, was calmly at work on his picture of "The Vision of St. Jerome" (now in the national gallery, London) when soldiers, bent on pillage, burst into his studio. He was, however, protected by their leader. After this event he left Rome for Bologna, where he painted various important works, and returned to Parma in 1531. Having engaged to execute several extensive frescoes in the church of St. Maria Steccata, after repeated delays, he was thrown into prison for breach of contract, and on being released, in place of carrying out his undertaking, he fled to Casal Maggiore, in the territory of Cremona, where he died soon afterward in 1540.

PARNASSUS, the name of two celebrated frescoes. The first, by Anton Raphael Mengs (1728–1779), represents Apollo and the Muses, together with Mnemosyne, the mother of the Muses, and is in the Villa Albani, Rome. The second is by Raphael and represents ancient art flourishing under the influence of the Renaissance. It is now in Rome.

PARNAS'SUS, a mountain greatly celebrated among the ancients, and regarded by the Greeks as the central point of their country. It was in Phocis. It has three steep peaks, almost always covered with snow, and seen from a great distance, the highest being 8,065 ft. above the level of the sea; but as only two of them are visible from Delphi, it was customary among the Greeks to speak of the two peaked Parnassus. On its southern slope lay Delphi (q. v.), the seat of the famous oracle.

PARNELL, CHARLES STEWART, statesman and parliamentary leader, was born at Avondale, in the county of Wicklow, Ireland, June 28, 1846. He was descended from Thomas Parnell, the poet (q.v.), and his mother, an American by birth, was the daughter of Commodore Charles Stewart, of the United States navy. The Parnells originally came from Congleton, Cheshire, England, and Mr. Parnell's great-grandfather, Sir John Parnell, was Chancellor of the Exchequer in Grattan's parliament, in which he vigorously denounced the Act of Union whereby Ireland lost her separate parliamentary government. Mr. Parnell's grand-uncle, Sir Henry, was raised to the English peerage, with the title of Lord Congleton, during Lord Melbourne's administration.

The subject of this article was educated at the University of Cambridge, from which, however, he did not receive a degree, but left it in order to travel in the U. S., after which he took up his residence at his home in Avondale; being appointed high sheriff of the county in 1874. In the same year he offered himself as a candidate for parliament, opposing Col. Taylor, who sought a re-election. Mr. Parnell was defeated at the polls; but in 1875 he stood for county Meath, and received a majority of the votes. From the very outset he displayed a remarkable capacity for leadership and for parliamentary warfare. With few popular qualities, he yet made his way instantly to the front of the heterogeneous elements that had up to this time battled with little success in behalf of the Irish "national" cause. Of an apparently cold temperament, reserved, dignified, disdainful, with few of the ordinary graces of an orator, Mr. Parnell was a striking contrast to the enthusiastic, impulsive, impassioned debaters that Irishmen had been used to follow, and of whom O'Connell will always stand forth as a brilliant type. But perhaps the very absence of these characteristics made Mr. Parnell's personality the more powerful. His reticence, his dignity, and his coldness of manner gave an impression of reserved strength; his lack of the typical qualities of an Irishman only served to impress the English statesmen, who up to this time had never looked upon the Irish party in a serious light; and when, in 1876, this new leader, in conjunction with Mr. Biggar, succeeded in uniting the Nationalists into a well-disciplined and compact body, voting and speaking at the dictation of a single master-mind, it began to be understood that, for the first time, the Irish question had entered the domain of practical politics. The object that it has all along been the aim of the Irish party to attain is the repeal of the Act of Union and the restoration to the Irish people of home rule in all that concerns their local affairs. This means, of course, the restoration of the Irish parliament. (See HOME RULE.) The plan adopted by Mr. Parnell to secure the success of the scheme was both bold and effective. Briefly described, it was to be carried out on two parallel lines of action—in parliament and in Ireland. In parliament the aim of the Irish party was to adopt the most extreme tactics of obstruction; to delay all public business so far as possible; to make combinations with any party that might happen to be in opposition, in order to embarrass the government; to use the balance of power in such a way as to secure concessions as the price of votes; and, in a word, to make all legislation extremely difficult until the demands of Ireland should be considered and accepted. This policy was aided in Ireland by the formation of the Land League (see IRELAND—LAND LEAGUE) of which Mr. Parnell was one of the originators, and by the famous Plan of Campaign (q.v.), and it was carried out with singular tenacity and persistence, in the teeth of the most bitter opposition and denunciation from both of the great English parties. The sober and conservative traditions of the House of Commons were speedily set at naught. Its rules were ingeniously perverted to defeat their own objects. Every important piece of legislation was attacked, delayed, and, in some cases, defeated by the able combinations of the Irish party under its great leader, with some of the other elements of opposition.

Thus, in the session of 1876, the Parnellites, as they began to be called, opposed with great persistence the bill for the annexation of the Transvaal, the flogging clauses of the Mutiny act, the Prisons bill; and, being joined by Mr. Chamberlain and other leading radicals, the bill abolishing flogging in the army was carried in the teeth of official opposition. Many were the scenes of excitement and disorder that marked this series of fierce parliamentary battles, and all-night sittings of the house became often necessary.

Side by side with the development of this new policy the land agitation in Ireland grew and became a source of widespread public interest. To aid the movement, and to relieve those tenants who suffered by eviction, Mr. Parnell made a visit to America in December, 1879, and there raised by popular subscription the sum of $350,000. In the following year he was simultaneously elected to parliament from the county of Meath, the county of Mayo, and the city of Cork, the last of which he chose to represent. His generally admitted claim to lead his party was now formally ratified, when, in May, 1880, the Irish members of parliament chose him leader by a vote of 23 to 18 for Mr. Shaw. Continuing the land agitation, he was arrested and imprisoned in October, 1881, on the charge of intimidation and of obstructing the operation of the new Land Act. (See IRISH LAND LAWS.) He remained in Kilmainham jail until April, 1882, when he was released on parole, and at once resumed his policy of obstruction in parliament, being so successful in blocking business that the government instituted a change in parliamentary procedure by adopting the "cloture" (q.v.), in the hope of limiting obstructive debate.

At the general election of 1885 he was re-elected from Cork, and by a political bar-

gain with the Conservative party secured the election of a number of conservative candidates, though soon after he repudiated the bargain and threw his votes on the Liberal side (Jan., 1886), defeating the Conservative administration of Lord Salisbury. Mr. Gladstone, who by this change succeeded to office, was now definitely committed to the adoption of a measure of Home Rule for Ireland, and on April 8, 1886, introduced a bill to that effect, which ruptured the liberal party, led to the formation of the new Liberal-Unionist party (q.v.), and the overthrow of the Gladstonian administration (June 8).

In 1887 Mr. Parnell himself introduced a land bill which, as a whole, the Salisbury government refused to accept, though many of its important provisions were subsequently incorporated into the government's own measure. In the session of the same year a genuine sensation was caused by the publication, in the *London Times*, of the fac-simile of a letter purporting to have been written by Mr. Parnell to a friend, palliating the murder of a Mr. Burke in Phœnix Park, Dublin, in 1882. On the night of the publication of this document Mr. Parnell returned to the House of Commons, from which he had been absent, and in an animated speech denounced the letter as a base and infamous forgery. Subsequently, on a motion of Sir Charles Lewis, which, though demanding that the publisher of the *Times* should be brought to the bar of the House, was not framed in the interests of the Irish party, the prominent Irish members promptly demanded that the question of the authenticity of the letter should be investigated by a committee of the House of Commons, composed, if the House thought fit, entirely of Conservative members. The government declined to grant a committee, but promised that if Mr. Parnell liked to take action against the *Times*, he should have the assistance of the law officers of the Crown—a proposal which was treated with ridicule by the Irish members and their friends. Mr. Parnell refused to bring an action for libel on account of the alleged forgeries and the charges of complicity with assassins brought against him and his associates in the series of articles published by the *Times* under the title of *Parnellism and Crime*, because he had no confidence in a Middlesex jury. After the collapse of the action brought against the *Times*, in May, 1888, by Mr. Frank Hugh O'Donnell, a former colleague, at which other damaging letters were put in by the attorney-general, Mr. Parnell again demanded a parliamentary inquiry, and alleged that these other letters were also forgeries. The government refused to grant a committee of the House on a question of privilege, but decided that the whole of the charges against Mr. Parnell and the Irish party should be investigated by a commission of judges. In the course of this inquiry it was fully proven that the letters attributed to Parnell were forgeries, the work of a miserable creature named Pigott, who after the exposure fled to France and died by his own hand. The commission's report amounted to an exoneration of Mr. Parnell from all the substantial charges made against him by the *Times*. He was now at the very height of his prestige, and soon after the publication of the report was received with indescribable enthusiasm by great mass-meetings. Edinburgh presented him with the freedom of the city ; nearly 150 liberal organizations sent him congratulatory addresses, and his colleagues entertained him at a birthday banquet. Unfortunately, his downfall was near at hand.

For a long time rumors had been current in political circles connecting the name of Mr. Parnell with that of the wife of Capt. W. H. O'Shea, formerly member of parliament for Galway, and long an enthusiastic follower of Parnell. These rumors grew in definiteness when, in 1889, a sudden rupture occurred in the relations existing between Mr. Parnell and Capt. O'Shea, and were confirmed when, in 1890, Capt. O'Shea applied for a divorce from his wife, naming Mr. Parnell as co-respondent. The case was tried in Nov., 1890, and no defense being made, the divorce was granted, Mr. Parnell being condemned in costs.

This decision proved a most serious blow at the reputation and political power of Parnell, since the testimony adduced showed him to have been guilty not only of immorality, but also of falsehood and treachery, while circumstances developed in the course of the trial made him appear in a ludicrous light as well. The immediate political effects of the trial may be briefly sketched.

Mr. Parnell offered to resign the leadership of the Irish party, but his offer was at first declined. At once, however, it became known that Mr. Gladstone had written a letter to Mr. Justin McCarthy, stating that, in case Mr. Parnell remained the leader of the Home Rule cause, it would be impossible for himself or for the liberals generally to continue to co-operate politically with the Irish party. When this letter had been made public, it was supposed that Mr. Parnell would renew his offer to resign. He resolutely refused to do so, and, in fact, resisted strenuously an attempt to depose him, which was, however, successful, Mr. McCarthy being chosen in his place. Parnell at once caused a division in his party, and denounced with unsparing bitterness both Mr. Gladstone and those of his own late colleagues who had set their devotion to Ireland above their personal liking and admiration for himself. He at once issued an appeal to the people of Ireland, and in two elections that followed the scandal nominated candidates of his own in opposition to those of the party caucus. In both these elections (Kilkenny and North Sligo) the Parnell candidates were defeated ; and by the commencement of June, 1891, the Home Rule party seemed hopelessly divided, with a prospect of the final triumph of the anti-Parnellites, on whose side the Roman Catholic priesthood had at last thrown its powerful influence. In July (1891) Mr. Parnell married Mrs. O'Shea. He d. Oct. 6, '91.

PAR'NELL, Henry Brooke. See **Congleton, Lord.**

PAR'NELL, Thomas, 1679–1718; b. Dublin; son of an English landed proprietor. He graduated at Trinity college, and was ordained deacon, though under the canonical age. In 1705 he was appointed archdeacon of Clogher. About this time he began to compose verses, in the manner of Pope; they attracted much attention, and secured him the friendship of the London wits. He contributed to the *Spectator* and *Guardian;* and was the associate of Pope, Arbuthnot, and Gay, in the "Scriblerus Club." On the fall of the whig government, near the close of Anne's reign, he went over to the tories, and stood in high favor with the Oxford administration. But his prospects of advancement from that quarter were destroyed by the overthrow of the tories at the death of the queen. By the influence of Swift he was made prebend in 1713, and 3 years later he was presented to the vicarage of Finglass. His disappointment at not obtaining more adequate promotion, and the death of his wife, which happened in 1712, threw him into a profound melancholy; and he is said to have hastened his death by intemperance. An edition of his poems, selected by Pope, appeared soon after his death; and a volume of doubtful authenticity, containing his posthumous works, was published in 1758. *The Hermit* is his best known poem; and among his other productions, *The Rise of Woman, The Fairy Tale, The Vigil of Venus,* and *The Allegory on Man,* deserve mention. A life of him, by Goldsmith, appears in the latter's works.

PARODY (Gr. *para,* beside, and *ode,* a song), the name given to a burlesque imitation of a serious poem. Its peculiarity is that it preserves the form, and as far as possible the words of the original, and thereby differs from a travesty, which is a looser and less literal kind of burlesque. The invention of parodies is commonly ascribed to the Greeks (from whom, at least, we have derived the name); the first parodist, according to Aristotle, being Hegemon of Thasos, who flourished during the Peloponnesian war; according to others, Hipponax. From the fragments that are extant of ancient parody, we infer that Homer was the favorite subject of comic imitation.
The *Batrachomyomachia* (Battle of the Frogs and Mice), erroneously ascribed to Homer, is also a happy and harmless specimen of the parody, which, however, soon began to exchange its jocose and inoffensive raillery for a biting and sarcastic banter, of which numerous specimens may be seen in the comedies of Aristophanes; while the philosopher Timon of Philus invented, under the name of *Silla,* a new species of satirical parody. Among the Romans we first meet with this form of literature in the period of the decline; All the power of Nero could not prevent his verses from being parodied by Persius. Among modern nations the French—as might naturally be expected from their character—have been most addicted to this literary mimicry. Corneille parodied Chapelain in his *Cid,* and Racine parodied Corneille. The *potpourris* of Désangiers are considered by his countrymen models of this ungracious kind of literature. Schiller's famous poem of the *Bell* has been often parodied by German wits. In England, perhaps the best compositions of this nature are the *Rejected Addresses* of the brothers James and Horace Smith. Thackeray's *Miscellanies* also contain some very clever and satirical prose parodies upon certain of his brother novelists, as do Bret Harte's *Condensed Novels.*

PAROLE (literally, a word) is the declaration made on honor by an officer, in a case in which there is no more than his sense of honor to restrain him from breaking his word. Thus a prisoner of war may be released from actual prison on his parole that he will not go beyond certain designated limits; or he may even be allowed to return to his own country on his parole not to fight again, during the existing war, against his captors. To break *parole* is accounted infamous in all civilized nations, and an officer who has so far forgotten his position as a gentleman, ceases to have any claim to the treatment of an honorable man, nor can he expect quarter should he again fall into the hands of the enemy he has deceived.

PAROPAMISAN MOUNTAINS. See **Afghanistan.**

PARQUET, Parrakeet', or **Parroquet,** a name very commonly given to many of the smaller species of the parrot family; generally to species having long tails, and natives of the East Indies, Africa, and Australia, not so frequently to American species; although it is sometimes also applied to some of these, indifferently with the name parrot.—One of the most beautiful groups of the *psittacidæ,* combining gracefulness of form with splendor of plumage, is that to which the **Alexandrina Paroquet** or **Ring Paroquet** (*Palæornis Alexandri*) belongs. It is about the size of a common pigeon, green, with a red collar, whence its name ring paroquet, and is a native of the East Indies. It is said to have been brought to Europe by some of the members of Alexander the great's expedition to India, and to have been the first of the parrot tribe known to the Greeks and Romans, by whom it was highly prized, as it still is, not only for its beauty, but for its docility and its power of imitating human speech. Like many of its tribe, it is gregarious, and immense flocks make their abode in some of the cocoa-nut groves of the western parts of Ceylon, filling the air with the most deafening screams. The ring paroquet has many congeners, natives chiefly of the East Indies, exhibiting much variety of splendid plumage.—Somewhat like them in length and form of tail, but with longer and stronger legs, is the **Ground Paroquet,** or **Ground Parrot** (*Pezophorus formosus*), of Australia, a bird very common in all the southern parts of New Holland and in Van Dieman's Land, inhabiting *scrubs* or ground covered with very low underwood.

Its habits are very unlike those of parrots in general; it runs along the ground, and even seeks to escape from enemies by running, unwillingly takes wing, and then only for a short low flight. It makes no nest, but lays its eggs in a hole in the ground. It is a small bird, not much more than 12 in. in entire length, one half of which is occupied by the tail; its color, dark green above, yellowish below, less brilliant than in many of the parrot tribe, but finely marked and mottled. Its flesh has a very strong *game* flavor. There are numerous other Australian species, distributed in several genera, some of which, although less exclusively than that just noticed, live and seek their food on the ground. Some of them exhibit the greatest splendor of plumage. The only one we shall notice is the ZEBRA PAROQUET (*Melopsittacus undulatus*), a very beautiful little species which has often been brought to England, and has sometimes bred in it. In the vast inland plains of Australia, this paroquet is to be seen in flocks of many hundreds feeding on the seeds of the grasses, which afford food also to many other small species.

PA'ROS, one of the larger islands of the Grecian Archipelago, is situated w. of Naxos, from which it it separated by a channel from 4 to 6 m. wide. Greatest length, 15 m.; greatest breadth, 9 m.; area, about 95 sq.m.; pop. 9,000. The surface is hilly, the scenery picturesque, and the soil naturally fertile, but imperfectly cultivated. The island is especially productive in cotton, wax, honey, partridges, and wild pigeons. Near the middle of the island, the mountain Capresso (ancient *Marpessa*) abounds in the famous Parian marble, which was used by many of the greatest sculptors of antiquity. Parekhia, on the w. coast, is the principal town, and Naussa, on the n. coast, is the chief port.

In ancient times, Paros, which is said to have been colonized by Cretans, attained great maritime prosperity, and became wealthy and powerful. It submitted to the Persians; and after the battle of Marathon was assailed ineffectually by Miltiades, who received here the wound of which he soon after died. After the defeat of Xerxes, Paros came under the supremacy of Athens, and shared the fate of the other Cyclades. Archilochus, the inventor of Iambic verse, was born here.

PAROTID GLAND. See SALIVARY GLANDS.

PARQUETRY, a kind of wood mosaic used only for flooring. The art of making inlaid wood floors has until lately much declined in this country, but on the continent it has been much in use, and has been carried to great perfection. Parquetry floors are usually of oak, but other and more ornamental woods have also been much used for giving variety and beauty to the pattern. In the more elaborate kinds of parquetry, veneers are used, but it is much more generally composed of blocks of wood squared at the sides, and laid down so as to combine and form a geometric pattern. Of late the taste for this work has revived in Britain, and it is beginning to be extensively employed in the better class of buildings.

PARR, CATHARINE. See CATHARINE PARR.

PARR, genus of fish. See PAR.

PARR, SAMUEL, LL.D., a once notable scholar, was b. Jan. 15, 1747, at Harrow-on-the-hill. He entered Emanuel college, Cambridge, in 1765; but the death of his father, two years afterward, necessitated his doing something for himself, and he was, in consequence, induced to accept an assistant-mastership at Harrow, where he remained five years. The head-mastership then becoming vacant, Parr applied for it, but was rejected, whereupon he left, and started as an independent schoolmaster. In 1776 he was appointed master of Colchester school, where he was ordained priest, and obtained the curacies of Hythe and Trinity church. Next year he became master of Norwich school; but in 1786 settled at Hatton in Warwickshire, where he spent the rest of his life. In 1787 he published an edition of Bellenden, to which he prefixed his celebrated preface, which is as remarkable for its uncompromising advocacy of whig principles as for the scrupulous Ciceronianism of its Latinity. He died Mar. 6, 1825.

It is almost impossible to understand the reputation which Parr once had. None of his voluminous writings justify it. That he was in some respects an accomplished, and even a great scholar, is undoubted, for he could write Latin of Ciceronian purity and finish; but it is equally undoubted that he never did anything with his boasted scholarship. Parr has left the world absolutely nothing to keep it in remembrance of him, yet his complete works (edited by Dr. J. Johnstone in 1828)—exclusive of his contributions to periodicals—form eight enormous tomes, and contain 5,734 octavo pages, many of them printed in small type. They relate to matters historical, critical, and metaphysical, but in all of them "the thread of Parr's verbosity is finer than the staple of his argument." What, then, gave him the fame that he certainly enjoyed during his life? Beyond all question, it was his conversational powers. He was an amazing, an overwhelming talker. Bold, dogmatic, arrogant, with a memory profoundly and minutely retentive, and with a genuine gift of ephemeral epigram, he seemed, at the tables of statesmen, and wits, and divines, to be a man of tremendous talent, capable of any literary feat; but the learning and the repartee have left little trace of their existence, and posterity declines to admire the wonders that it has neither seen nor heard. See De Quincey's famous essay on "Dr. Samuel Parr on Whiggism in its Relations to Literature" (Author's edition, vol. 5. Edin. Adam & Charles Black, 1862).

PARR, THOMAS, 1483–1635; b. England. According to a curious pamphlet published by John Taylor in 1635, and called *The Olde, Olde, Very Olde Man,* etc., Parr's first mar-

riage took place in his 81st year, and his second when he was 120. He is said to have had a love affair when 105 years old, and to have been condemned to do public penance for it, by standing in a sheet at the church of Alderbury. He died in London, and was buried in Westminster abbey.

PAR'RA. See JACANA.

PARRAMATTA. See PARAMATTA.

PARRAS, a well-built t. of Mexico, in the province of Coahuila, 84 m. w. of Salthillo, near the e. shore of lake Parras. It derives its name from a species of indigenous vine much cultivated, and has always been celebrated for its wines and brandies. There are many old Spanish families here. Pop. 13,500.

PARRHA'SIUS, one of the greatest painters of ancient Greece, was the son of Evenor, himself an artist, and was b. at Ephesus in the 5th c. B.C. He practiced his profession, however, at Athens, the inhabitants of which held him in high estimation, and conferred on him the rights of citizenship. He was already celebrated in the time of Socrates, with whom, according to Xenophon, he held a conversation (*Mem.* 3, 10), and was also a younger contemporary of Zeuxis. The date of his death is unknown. Seneca, who lived several hundred years after, tells a monstrous story about him. He says that when Parrhasius was painting his "Prometheus Vinctus," he got hold of one of the prisoners taken at the capture of Olynthus by Philip of Macedon (347 B.C.), and crucified him in his studio that he might copy from life the expression of agony. Fortunately for Parrhasius's memory, the anecdote is almost certainly untrue, as it would require us to suppose that he was still alive and painting when upward of a hundred years old. Parrhasius appears to have surpassed all his predecessors in purity of design, accuracy of drawing, force of expression, and what is technically called "finish." According to Pliny, he was the first who established a true proportion between the different parts of a picture, and delineated with elegance and precision all the minutiæ of the features, even to those evanescent motions that betray the most delicate sentiments of the soul. He painted the extremities, such as the hands and fingers, in so exquisite a style, that the intermediate parts seemed relatively—but *only* relatively—inferior. Quinctilian calls him the legislator of his art, because his canon of proportion for gods and heroes was followed by all contemporary and subsequent painters. Among his works were an apparently symbolical picture of the Athenian *Demos* ("people"), a "Theseus," "Naval Commander in full Armor," "Ulysses feigning Madness," "Castor and Pollux," "Bacchus and Virtue," a "Meleager, Hercules, and Perseus" on one canvas, a "Cretan Nurse with a Child in her Arms," a "Priest officiating with a Child bearing Incense," "Two Young Children," an "Achilles," an "Agamemnon," etc. But his subjects were not always of a pure or lofty character. His "Archigallus" (high-priest of Cybele) and his "Meleager and Atalanta" were most licentious representations, and gave such pleasure to the emperor Tiberius, a man of unbounded sensuality, that he kept them in his bedroom, and valued the second in particular at more than a million sesterces.

Parrhasius was of an excessively proud and arrogant disposition. He called himself the prince of painters, and claimed to be descended from Apollo; he also painted himself as the god Mercury, and then exposed his own portrait for the adoration of the crowd. His vanity was equal to his pride, and showed itself even in his apparel, which was of the most sumptuous kind. He generally dressed in a purple robe with a golden fringe, sported a gold-headed cane, and wore boots fastened with golden clasps.

PARRICIDE (Lat. *parricida*) is rather a popular than a legal term. In the Roman law it comprehended every one who murdered a near relative; but in English the term is usually confined to the murderer of one's father, or of one who is *in loco parentis*. The parricide does not, in any respect, differ in Britain from the murderer of a stranger; in both cases, the punishment is death by hanging. In the Roman law, a parricide was punished in a much more severe manner, being sewed up in a leather sack, along with a live cock, viper, dog, and ape, and cast into the sea to take his fate with these companions.

PARRIS, ALBION KEITH, 1788–1857; b. Maine; graduated at Dartmouth college in 1806, studied law and settled as a lawyer at Paris, Me., where he resided many years. In 1815 he was a representative in congress and three years later a U. S. district judge, at which time he removed to Portland. During the following 30 years he was a judge of probate, governor of Maine, U. S. senator, judge of the state supreme court, second comptroller of the U. S. treasury, and mayor of Portland, in which city he died.

PARRIS, SAMUEL, 1653–1720; b. London, Eng.; went in youth to Massachusetts; studied at Harvard college, but did not graduate; was a successful merchant in Boston; entered the ministry, and was pastor of the church at Danvers, Mass., in 1689–96. The delusion of Salem witchcraft originated in his family, his daughter and niece accusing Tituba, living as a servant in the family, with bewitching them. Mr. Parris beat her and compelled her to confess herself a witch. Her husband for his own safety accused others, and a sad persecution was commenced. The delusion lasted 16 months. Mr. Parris having been a zealous prosecutor, his church brought charges against him. He acknowledged his error, but was dismissed. After preaching for a time at Stow he removed to Concord, and preached six months at Dunstable. It should be remembered that at that time the most learned men in Europe, ecclesiastics and lawyers, were

believers in witchcraft; and that many years after the Salem delusion had passed away persons were put to death in England for the alleged offense.

PARRISH, Edward, 1822–72; b. Philadelphia; principal of the Philadelphia school of practical pharmacy, where he became professor of materia medica in 1864. He published, besides a large number of papers in scientific periodicals, *Practical Pharmacy*, 1856; *The Phantom Bouquet*, 1863; and *Education in the Society of Friends*, 1866. He was a commissioner to the Indians on the plains at the time of his death.

PARRISH, Joseph, 1779–1840; b. Philadelphia; educated at the university of Pennsylvania, where he took a degree in medicine, 1806. He began practice in Philadelphia; was connected with several local medical institutions; from 1816 to 1829 was surgeon of the Pennsylvania state hospital, and for the last five years of his life was consulting surgeon of the Philadelphia dispensary. He obtained a high rank in the profession; was noted for his philanthropy, and contributed many articles to the medical periodicals. He published a revised edition of *Lawrence on Hernia* with notes and an appendix.

PARRISH'S CHEMICAL FOOD is the popular name for a non-officinal preparation medicinally known as *Compound Syrup of Phosphate of Iron*, every dram of which contains 1 grain of phosphate of iron, 2½ of phosphate of lime, besides soda and potash. Mr. Parrish of Philadelphia was the first to publish a formula for this very useful compound.

PARROT, *Psittacus*, a Linnæan genus of birds, now the family *psittacidæ*, of the order *scansores*, or climbers (q.v.), comprehending a vast number of species, natives of almost all tropical and subtropical regions; a few species extending further north and south, in America, in New Zealand, and in Van Diemen's land, even to the neighborhood of lake Michigan in North America, and to Terra del Fuego in South America. They are mostly birds of splendid plumage; they vary very much in size, from the great macaw, more than three feet in length, tail included, to the little love-birds, not larger than sparrows. They are mostly gregarious, and are often seen in vast flocks, generally inhabiting forests, and making their nests in trees, feeding chiefly on fruits and seeds, partly also on leaves and buds; but some of them dwelling in open plains, feeding on the seeds of grasses and other plants of humble growth, bulbs and succulent parts of vegetables, and living mostly on the ground. The voices of the parrot tribe are generally harsh and discordant, although some of the smaller kinds have not unpleasant voices; but many of the larger have a remarkable power of imitating human speech, and in domestication become capable of articulating not only words but sentences. They exhibit a greater degree of intelligence than is usual in birds, with a monkey-like restlessness and love of trick; and although docile and affectionate, are generally of capricious irritable temper. They have a short, stout, hard beak, rounded on all sides, and enveloped at the base in a membrane in which the nostrils are pierced; the upper mandible generally much longer than the lower, much curved, and sharp pointed. The tongue is almost always very large, thick, round, and fleshy; the muscles which move the mandibles are more numerous and powerful than in most other birds. They make use of the powerful hooked bill as well as of the feet in climbing trees; and employ their feet as hands for holding their food, and bringing it up to the mouth. Their feet differ from those of all other climbers, in being covered with small tubercle-like scales instead of plates. Some have short and some have long tails. Most of them have short wings. Their intestines are very long and slender, and without cæca.

The *psittacidæ* are easily distinguished from all other birds; but their division into distinct subordinate groups has not been found so easy. Whilst the name parrot popularly includes all, except that it is seldom given to some of the smallest species, some are known by the names macaw, cockatoo, parrakeet, lory, love-bird, etc. See these heads. But some of these names are very vaguely applied. And although the parrot family is regarded as consisting of a number of very natural groups, the characters and limits of these groups have not yet been very well defined.

The name parrot, in its most restricted sense, is sometimes applied only to those species which have the upper mandible very distinctly toothed, the lower mandible longer than it is high; and the tail short, and square or rounded; but this use is rather ornithological than popular, the most restricted popular use equally including long-tailed species, such as the Caroline parrots, which are ornithologically ranked with the macaws. —The Caroline Parrot (*conurus Carolinensis*) is the species of which the northern range extends far beyond all others of its tribe to the shores of lake Michigan; although by the increase of cultivation, and the war waged against these birds for their depredations on orchards and corn-ricks, their numbers have been greatly diminished in regions where they were once plentiful. Its whole length is about 14 in., of which about one-half is occupied by the tail; the general color is green, shaded with blue, and diversified with orange, the wing primaries almost black. It is gregarious, prefers to roost in the holes of hollow trees, and in such situations also the females lay their eggs. It seems to love salt, frequenting salt *licks* like pigeons. It is easily tamed, but does not acquire the power of articulation.—Of the short-tailed parrots, one of the best-known is the Gray Parrot (*psittacus erythacus*), a west African species, about the size of a small pigeon, of an ash-gray color, with a crimson tail. It is famous for its docility, its power of articulation and of imitating noises of all kinds, its loquacity, and its mischievousness.

It is very often brought to Europe, and often lives to a great age in confinement. Individuals have been known to attain the age of nearly 100 years.—The GREEN PARROTS (*chrysotis*), natives of the tropical parts of South America, are also among the short-tailed parrots most frequently seen. See illus., LARKS, ETC., vol. VIII.,

PARROT-FISH, *Scarus*, a genus of fishes of the family *labridæ* (q.v.) or *cyclo-labridæ*, of oblong and massive form, with large scales, and remarkable for the structure of their jaws and teeth, the jaws being divided into halves by a median suture, the teeth incorporated with the bone in crowded quincuncial order, the surface even and polished in some species and rough in others, the oldest teeth forming the trenchant border of the jaw, and being succeeded by others as they are worn away, whilst new ones are formed behind. The species are numerous. Some of them feed on fuci, and some on corals, the younger branches of which they crush, so that the animal part affords them nourishment, whilst the calcareous part is rejected. They are fishes generally of brilliant colors, some of them of wonderful splendor, and have received the name parrot-fish partly on this account, and partly on account of a fancied resemblance in their jaws to a parrot's bill. Most of them are natives of tropical seas. One species is found in the Mediterranean (*S. creticus*), the *scarus* of the ancients, of which many wonderful stories were told as to its love, its wisdom, its ruminating, its emitting of sounds, etc., and which was esteemed the most savory and delicate of all fishes. It is still held in high esteem for the table. The Greeks cook it with a sauce made of its own liver and intestines.

PARROTT, ENOCH GREENLEAF, 1814–79; b. Portsmouth, N. H.; entered the navy at the age of 17, and was promoted to lieut. in 1841. In 1843 he accompanied commodore Perry in the frigate *Congress* to the w. coast of Africa. He was with Gen. Fremont in several engagements in the Mexican war, and was prominent in the siege resulting in the capture of Guaymas and Mazatlan. In the war of the secession he went with the expedition to Norfolk, Va., April, 1861, when the navy-yard was destroyed, and in that year was made commander. He was in command of the steamer *Augusta* at the battle of Port Royal, and engaged the confederate gunboats in Charleston Harbor, Jan. 13, 1863. In June, 1864, he commanded the iron-clad *Canonicus* in the engagement with Howett's battery and in subsequent engagements on James river, and was in command of the *Monadnock* at Wilmington, a favorite resort of blockade runners. He was present at the bombardment and surrender of Fort Fisher Jan. 15, 1865, under Admiral Porter and Gen. Terry, and was highly commended for gallantry. In 1866 he received a captain's commission, was promoted to commodore in 1870, rear-admiral in 1873, and retired from active service in 1874.

PARROTT, ROBERT PARKER, born Lee, N. H., 1804; graduate of West Point 1824; entered the army as 2d lieut. of artillery; was appointed assistant professor of mathematics at West Point and principal assistant professor of natural and experimental philosophy, and filled the office 1824–29. He was detailed for ordnance duty 1834, and was in the war against the Creeks. He was transferred to the ordnance corps as capt., 1836, resigned the same year, and was appointed superintendent of the West Point foundry at Cold Spring, Putnam co., N. Y. In 1844–47 he was judge of the court of common pleas in Putnam county. He invented a system of guns and heavy ordnance extensively used in the war against the secession, and of which the 10-pounder, 30-pounder, and 100-pounder are considered capable of producing the best results. One 30-pounder proved its power of endurance, having been fired 4,606 times before bursting. They were first introduced at the battle of Bull Run, July 21, 1861. He d. 1877.

PARRY, Sir WILLIAM EDWARD, commonly known as sir EDWARD PARRY, a celebrated English navigator, was born at Bath, Dec. 19, 1790. His father, who was a physician of some eminence, destined him for the medical profession; but acting on the advice of a friend, entered him as a first-class volunteer on board the *Ville-de-Paris*, the flag-ship of the channel fleet in 1803. After several years' service, he received his commission as lieut., Jan. 6, 1810. Though thus early engaged in active service, his education had not been neglected; he had attained at school to considerable eminence in classical knowledge; and for the first five years after entering the navy he had particularly studied French and mathematics under the chaplain's superintendence, after which he constantly employed his leisure time in nautical and astronomical studies. In Feb., 1810, he was sent to the Arctic regions in command of a ship, for the purpose of protecting the British whale fisheries and improving the admiralty charts of those regions; but in 1813 he was recalled and dispatched to join the fleet then blockading the coast of the United States. He remained on the North American station till the spring of 1817, and during this time he wrote and distributed MS. copies of a work entitled *Nautical Astronomy by Night*, in which rules were given for determining accurately the altitude of the pole by observations of the fixed stars. This work he subsequently published in London. Having returned to England too late to take part in the African exploring expedition, he was, at his urgent request, backed by the recommendations of Mr. Barrow, secretary to the admiralty, appointed to the command of the *Alexander*, under the orders of Capt. John Ross in the *Isabella*, and dispatched in search of the "northwest passage" in April, 1818. The expedition returned to England, having made no important discoveries. The admiralty were dissatisfied with the report of Capt. Ross; and Parry's opinion, though only communicated to his private friends, having become known to

them, he was again sent out (May, 1819), and this time commenced that career of discovery which has immortalized him as the greatest of all Arctic explorers. Parry on his return to Britain was hailed with the utmost enthusiasm and was made commander (Nov. 4, 1820) and a member of the royal society. He subsequently made a second and a third voyage to the same regions, but effected nothing further of importance. Parry now devoted himself to the discharge of his duties as hydrographer, but such labors were too monotonous for one of his temperament, and he accordingly prepared a plan of an expedition for reaching the north pole, which being submitted to the admiralty and approved of by them, his old ship the *Hecla* was fitted out for a polar expedition, and Parry set sail in her, accompanied by Lieut. J. C. Ross, April 4, 1827. See NORTHEAST AND NORTHWEST PASSAGES; POLAR EXPEDITIONS. The *Journals* of these voyages were published by order of the admiralty.

Parry's career as an explorer was now closed, and he again returned to his duties as hydrographer, but his health now gave way under this sedentary mode of life, and he exchanged his office for that of commissioner to the agricultural company of Australia, for which country he sailed July 20, 1829. He returned to England in Nov., 1834, and filled in succession various government appointments up till Dec., 1846, when he retired from active service, receiving a sinecure office. On June 4, 1852, he was raised to the rank of rear-admiral of the white, and in the following year was appointed lieutenant-governor of Greenwich hospital—an office which he held till his death, July 7, 1855, at Ems in Germany, whither he had gone for the benefit of his health. A complete edition of his voyages was published in 1833 (Lond. 5 vols.). His life has been written by his son, the Rev. Edward Parry, M.A., of Balliol college, Oxford (1857).

PARRY SOUND. See MELVILLE.

PARRY SOUND, part of the district of Muskoka and Parry Sound, Ont., Canada; on Georgian Bay, drained by the outlet of lake Nipissing; pop. of district, '91, 26,515.

PARSEES (people of Pars or Fars, i.e., ancient Persia) is the name of the small remnant of the followers of the ancient Persian religion, as reformed by Zerdusht, or Zoroaster, as he is commonly called. They are also known under the denomination of Guebers, under which head some account will be found respecting their recent history and present numbers. The pre-Zoroastrian phase or phases of their primeval religion will probably forever remain shrouded in deep obscurity; so much, however, is fully established by recent investigations that this, and what afterwards became the Brahmanic religion, were originally identical; that in consequence of certain social and political conflicts between the Iranians and the Aryans, who afterwards peopled Hindustan proper, an undying feud arose, in the course of which the former forswore even the hitherto common faith, and established a counter faith (Ahura), a principal dogma of which was the transformation of the ancient, now hostile, gods into demons, and the branding of the entire Deva religion as the source of all mischief and wickedness. Zerdusht, the prophet, whose era is given very differently by ancient writers and by modern investigators, placed variously between 500 or 600 B.C. (Röth) and 1200 B.C. (Haug), had, like all prophets and reformers, many predecessors, chiefly among the Soshyantos or fire-priests (Atharvans); yet to him belongs the decisive act of separating forever the contending parties, and of establishing a new community with a new faith—the Mazdayasna or Parsee religion proper, which absorbed the old Ahura religion of the fire-priests. Referring for a summary of what is known and speculated about the person of the great reformer to the article under his name, we shall here confine ourselves to pointing out, as the characteristics of his leading doctrines, that the principle of his theology was as pure a monotheism as ever the followers of the Jehovistic faith were enjoined. He taught the existence of but one deity, the Ahura, who is called Mazdaô (see ORMUZD), the creator of all things, to whom all good things, spiritual and worldly, belong. The principle of his speculative philosophy is dualism, i.e., the supposition of two primeval causes of the real and intellectual world; the Vohu Manô, the good mind, or reality (Gaya), and the Akem Manô, or the naught mind, or non-reality (Ajyâiti); while the principle of his moral philosophy is the triad of Thought, Word, and Deed. Not long, however, did the pure idea of monotheism prevail. The two sides of Ahura Mazdaô's being were taken to be two distinct personages—God and Devil—and they each took their due places in the Parsee pantheon in the course of time:—chiefly through the influence of the sect of the Zendiks, or followers of the Zend, i.e., interpretation. According to Zerdusht, there are two intellects, as there are two lives—one *mental* and one *bodily;* and, again, there must be distinguished an *earthly* and a *future* life. The immortality of souls was taught long before the Semites had adopted this belief. There are two abodes for the departed—Heaven (Garô-Demâna, the house of the angels' hymns, Yazna, xxviii. 10; xxxiv. 2; cf. Is. vi., Revelat., etc.) and Hell (Drâjô-Demâna, the residence of devils and the priests of the Deva religion). Between the two there is the bridge of the Gatherer or Judge, which the souls of the pious alone can pass. There will be a general resurrection, which is to precede the last judgment, to foretell which Sosiosh (Soskyans), the son of Zerdusht, spiritually begotten (by later priests divided into three persons), will be sent by Ahuramazdao. The world, which by that time will be utterly steeped in wretchedness, darkness, and sin, will then be renewed; death, the arch-fiend of creation, will be slain, and life will be everlasting and holy. These

are the outlines of the Zoroastrian creed, as it flourished up to the time of Alexander the Great, throughout ancient Irania, including Upper Thibet, Cabulistan, Sogdiana, Bactriana, Media, Persis, etc.; and it is curious to speculate on the consequences which might have followed Marathon and Salamis had the Persians been victorious. The religion of Ormuzd would have dethroned the Olympians, as it dethroned the gods of the Assyrians and Babylonians; and it would certainly have left its traces upon the whole civilized world unto this day in a much more direct and palpable shape than it now does. From the death of Alexander, however, it gradually lost ground, and rapidly declined under his successors, until, in the time of Alexander Severus, Ardshir "Arianos" (cf. Mirkhond ap. de Sacy, *Mémoires sur div. Aut. de la Perse*, etc., p. 59), the son of Babegan, called by the Greeks and Romans Artaxerxes or Artaxares, who claimed descent from the ancient royal lineage of Persia, took the field against Artabanus, and slew him (225), thus putting an end to the four hundred years' rule of the Parthians, and founded the Sassanide dynasty. This he effected in conjunction with the national Persians, who hated the "semi-Greek" dynasty of the Arsacidæ, their leaning to the foreign, and contempt for the Zend religion, and finally for their powerlessness against the spreading conquests of the Romans. The first act of the new king was the general and complete restoration of the partly lost, partly forgotten books of Zerdusht, which he effected, it is related, chiefly through the inspiration of a Magian sage, chosen out of 40,000 Magians. The sacred volumes were translated out of the original Zend into the vernacular, and disseminated among the people at large, and fire temples were reared throughout the length and the breadth of the land.

The magi or priests were all-powerful, and their hatred was directed principally against the Greeks. "Far too long," wrote Ardshir, the king, to all the provinces of the Persian empire, "for more than five hundred years has the poison of Aristotle spread." The fanaticism of the priests often also found vent against Christians and Jews. The latter have left us some account of the tyranny and oppression to which they as unbelievers were exposed—such as the prohibition of fire and light in their houses on Persian fast-days, of the slaughter of animals, the baths of purification, and the burial of the dead according to the Jewish rites—prohibitions only to be bought off by heavy bribes. In return, the magi were cordially hated by the Jews, and remain branded in their writings by the title of demons of hell (*Kidushin*, 72 a.). To accept the instruction of a magian is pronounced by a Jewish sage to be an offense worthy of death (*Shabb.* 75 a.; 156 b.). This mutual animosity does not, however, appear to have long continued, since in subsequent times we frequently find Jewish sages (Samuel *the Arian*, etc.) on terms of friendship and confidence with the later Sassanide kings (cf. Moed Katan, 26 a., etc.). From the period of its re-establishment, the Zoroastrian religion flourished uninterruptedly for about 400 years, till, in 651 A.D., at the great battle of Nahavand (near Ecbatana), the Persian army, under Yezdezird, was routed by the caliph Omar. The subsequent fate of those that remained faithful to the creed of their fathers has been described, as we said before, under GUEBERS. At present some remnants inhabit Yezd and Kirmân, on the ancient soil of their race; others, who preferred emigration to the endless tribulations inflicted upon them by the conquering race, found a resting-place along the western coast of India, chiefly at Bombay, Surat, Nawsari, Achmedâbâd, and the vicinity, where they now live under English rule, and are recognized as one of the most respectable and thriving sections of the community, being for the most part merchants and landed proprietors. They bear, equally with their poorer brethren in Persia, with whom they nave of late renewed some slight intercourse for religious and other purposes—such as their Rivâyets or correspondences on important and obscure doctrinal points—the very highest character for honesty, industry, and peacefulness, while their benevolence, intelligence, and magnificence outvies that of most of their European fellow-subjects. Their general appearance is to a certain degree prepossessing, and many of their women are strikingly beautiful. In all civil matters they are subject to the laws of the country they inhabit; and its language is also theirs, except in the ritual of their religion, when the holy language of Zend is used by the priests, who, as a rule, have no more knowledge of it than the laity.

We have spoken of the leading fundamental doctrines as laid down by their prophet. Respecting the practical side of their religion, we cannot here enter into a detailed description of their very copious rituals, which have partly found their way into other creeds. Suffice it to mention the following few points. They do not eat anything cooked by a person of another religion; they also object to beef, pork, especially to ham. Marriages can only be contracted with persons of their own caste and creed. Polygamy, except after nine years of sterility and divorce, is forbidden. Fornication and adultery are punishable with death. Their dead are not buried, but exposed on an iron grating in the Dokhma, or tower of silence, to the fowls of the air, to the dew, and to the sun, until the flesh has disappeared, and the bleaching bones fall through into a pit beneath, from which they are afterwards removed to a subterranean cavern.

Ahuramazdao being the origin of light, his symbol is the sun, with the moon and the planets, and in default of them the fire, and the believer is enjoined to face a luminous object during his prayers. Hence, also, the temples and altars must forever be fed with the holy fire, brought down, according to tradition, from heaven, and the sullying of whose flame is punishable with death. The priests themselves approach it only with a

half-mask (Penom) over the face, lest their breath should defile it, and never touch it with their hands, but with holy instruments. The fires are of five kinds; but however great the awe felt by Parsees with respect to fire and light (they are the only eastern nation who abstain from smoking), yet they never consider these, as we said before, as anything but emblems of divinity. There are also five kinds of "sacrifice," which term, however, is rather to be understood in the sense of a sacred action. These are—the slaughtering of animals for public or private solemnities; prayer; the Daruns sacrament, which, with its consecrated bread and wine in honor of the primeval founder of the law, Hom or Heomoh (the Sanscr. *Soma*), and Dahman, the personified blessing, bears a striking outward resemblance to the sacrament of the Lord's supper; the sacrifice of expiation, consisting either in flagellation or in gifts to the priest; and, lastly, the sacrifice for the souls of the dead. The purification of physical and moral impurities is effected, in the first place, by cleansing with holy water (Nirang), earth, etc.; next, by prayers (of which sixteen, at least, are to be recited every day) and the recitation of the divine word; but other self-castigations, fasting, celibacy, etc., are considered hateful to the divinity. The ethical code may be summed up in the three words—purity of thought, of word, and of deed: a religion "that is for all, and not for any particular nation," as the Zoroastrians say. It need hardly be added that superstitions of all kinds have, in the course of the tribulations of ages, and the intimacy with neighboring countries, greatly defiled the original purity of this creed, and that its forms now vary much among the different communities of the present time.

Something like a very serious schism, however, has lately broken out in the Parsee communities, and the modern terms of conservative and liberal, or rather bigot and infidel, are almost as freely used with them as in Europe. The sum and substance of these innovations, stoutly advocated by one side, and as stoutly resisted by the other, is the desire to abolish the purification by the Nirang—a filthy substance in itself,—to reduce the large number of obligatory prayers, to stop early betrothal and marriage, to suppress the extravagance in funerals and weddings, to educate women, and to admit them into society. Two counter alliances or societies, the "Guides of the Worshipers of God" and "the True Guides" respectively, are trying to carry out at this moment, by means of meetings, speeches, tracts, etc., the objects of their different parties.

The literature of the Parsees will be found noticed under PERSIAN LANGUAGE AND LITERATURE, and AVESTA. Besides the latter, which is written in ancient Zend, and its Gujarati translation and commentaries, there are to be mentioned, as works specially treating of religious matters, the *Zardusht-Nameh*, or Legendary History of Zerdusht; the *Sadder*, or Summary of Parsee Doctrines; the *Dabistan*, or School of Manners; the *Desatir*, or Sacred Writings, etc. All these have been translated into English and other European languages.

On the influence Parseeism has had upon Judaism and its later doctrines and ceremonial, and, through it, upon Christianity and Mohammedanism—which besides drew from it directly—we cannot dwell here at any length. So much, however, may be stated, that the most cursory reading of the sacred Parsee books will show, in a variety of points, their direct influence upon the three Semitic creeds. Of works treating on the subject of this article, we mention principally, Hyde, *Vet. Rel. Pers. Hist.* (Oxon., 1760, 4to); Ousely, *Travels in the East* (Lond. 1819); Anquetil du Perron, *Exposition des Usages des Parses;* Rhode, *Diehel. Sage der alten Baktrier, Meder u. Perser*, etc. (Frank.-a-M., 1820, 8vo); Dosabhoy Framjee, *The Parsees*, etc. (Lond. 1858); Dadabhai Naoroji, *The Manners and Customs of the Parsees;* and *The Parsee Religion* (Liverpool, 1861, 8vo); and lastly, Haug's *Essays on the Parsee Religion* (Bombay, 1862), and Spiegel's *Erân* (Berl. 1863.)

PARS'LEY, *Petroselinum*, a genus of plants of the natural order of *umbelliferæ*. The species are annual or biennial, branching, smooth, herbaceous plants, with variously pinnated leaves.—COMMON PARSLEY (*P. sativum*), which has tripinnate shining leaves, one of our best known culinary plants, is a native of the south of Europe, growing chiefly on rocks and old walls, and naturalized in some parts of England. The cultivation of parsley is extremely simply, and an annual sowing is generally made, although when cut over and prevented from flowering, the plant lives for several years. A variety with curled leaflets is generally preferred to the common kind with plain leaflets, as finer and more beautiful, being often used as a garnish; it is also safer, as the poisonous fool's parsley (q.v.) is sometimes gathered by mistake instead of the other.—HAMBURG PARSLEY is a variety with a large white carrot-like root, cultivated for the sake of its root, and much in the same way as the carrot or parsnip. To produce large roots and of delicate flavor, a very rich soil is required. The foliage of parsley is not merely of use for flavoring soups, etc., but is nutritious, at the same time that it is stimulating, a quality which it seems to derive from an essential oil present in every part of the plant. Parsley contains also a peculiar gelatinous substance called *apiine*. The bruised leaves of parsley are sometimes employed as a stimulating poultice. The seeds are a deadly poison to many birds, and when powdered, they are sometimes used for killing lice.

PARSNIP, *Pastinaca*, a genus of plants of the natural order *umbelliferæ*, having compound umbels with neither general nor partial involucres; yellow flowers with roundish, involute, sharp-pointed petals; calyx almost without teeth; fruit dorsally compressed and

flat, with a broad border, the ridges very fine. The species are annual, biennial, or perennial herbaceous plants, with carrot-like, often fleshy roots, and pinnate leaves —The COMMON PARSNIP (*P. sativa*) is a native of England, although not of Scotland, and is abundant in some districts, particularly in chalky and gravelly soils. It is also found in many parts of Europe, and of the north of Asia. It is a biennial, with angular furrowed stem, 2 to 3 ft. high, pinnate leaves with ovate leaflets, rather shining, cut, and serrated, and a three-lobed terminal leaflet. The root of the wild plant is white, aromatic, mucilaginous, sweet, but with some acridness; and injurious effects have followed from its use. Cultivation has greatly modified the qualities both of the root and foliage, rendering them much more bland. The parsnip has long been cultivated for the sake of its root, which in cultivation has greatly increased in size, and become more fleshy. The flavor is disliked by some, as well as the too great sweetness, but highly relished by others; and the root of the parsnip is more nutritious than that of the carrot. The produce is also, on many soils, of larger quantity; and although the parsnip delights in a very open rich soil, it will succeed in clayey soils far too stiff for the carrot. It is rather remarkable that it has not been extensively cultivated as a field-crop, and for the feeding of cattle, except in the Channel islands and in limited districts of continental Europe; more particularly as cattle are very fond of it, and not only the flesh of cattle fed on it is of excellent quality, but the butter of dairy-cows fed on parsnips in winter is far superior to that produced by almost any other kind of winter-feeding. The mode of cultivation of the parsnip scarcely differs from that of the carrot. There are several varieties in cultivation. A very large variety, cultivated in the Channel islands on deep sandy soils, has roots sometimes 3 or 4 ft. long; but this is fully twice the ordinary length, and there is a smaller turnip-rooted variety sometimes cultivated in gardens where the soil is very shallow. The parsnip is used chiefly in winter, whether for the table or for feeding cattle. It is improved rather than injured by frost; but is apt to become *rusty* if allowed to remain too long in the ground; and exhibits acrid qualities after it has begun to grow again in spring. The root of the parsnip is much used in the north of Ireland for making a fermented liquor, with yeast and hops; and both in England and Ireland, for making *parsnip wine*, which has some resemblance to Malmsey wine.—Another species, the CUT-LEAVED PARSNIP or SEKAKUL (*P. sekakul*), having pinnatifid cut leaflets, a native of India, Syria, and Egypt, is cultivated in the Levant, and is very similar in its uses to the common parsnip.

PARSON, in English ecclesiastical law, means the incumbent of a benefice in a parish. He is called parson (Lat. *persona*) because he represents the church for several purposes. He requires to be a member of the established church of England, and to be duly admitted to holy orders, presented, instituted, and inducted; and requires to be 23 years of age. When he is inducted, and not before, he is said to be in full and complete possession of the incumbency. The distinction between a parson and a vicar is, that the parson has generally the whole right to the ecclesiastical dues in the parish, whereas the vicar has an appropriator over him, who is the real owner of the dues and tithes, and the vicar has only an inferior portion.

PARSONS, a city in Labette co., Kan., on Labette creek and the Missouri, Kansas, and Texas and the Kansas City, Fort Scott, and Memphis railroads. It has churches, schools, banks, and newspapers. The car and machine shops of the M. K. and T. railroad are here, and there are flour mills, elevators, foundry, etc. Pop. '90, 6,736.

PARSONS, ALBERT ROSS, American musician, was born at Sandusky, Ohio, Sept. 16, 1847; studied music with R. Denton, Buffalo, N. Y., 1853–57, with F. L. Ritter, New York city, 1863–7, with Moscheles, Reinecke, Papperitz and Richeter in Leipsic, 1867–69, and with Tausig, Weitzmann, Kullak, and Wuerst in Berlin, 1870–71; is the composer of the songs *Night has a Thousand Eyes; Break, Break*, and *Three Fishes*, which have been extensively sung in concert in America and Europe. Mr. Parsons is the originator of the "Synthetic method" for pianoforte; has translated Wagner's *Beethoven* and is the author of *Parsifal; New Light from the Great Pyramid*, a study in cosmic religion and prehistoric Christianity. He is president of the American College of Musicians of the university of the state of New York, and vice-president of the Metropolitan college of music.

PARSONS, JONATHAN, 1705–76; b. Mass.; graduated at Yale college, 1729; was ordained pastor of the Congregational church in Lyme, Conn., 1731, where he continued until 1745; settled at Newburyport, Mass., in 1746, where he died. He was distinguished for his learning, for his skill as a controvertist, and as a preacher. He published *Letters on the Christian Ministry; Letters on Baptism; Lectures on Justification; Good News from a Far Country, in Seven Discourses; A Sermon on the Death of G. Whitefield; Freedom from Civil and Ecclesiastical Tyranny the Purchase of Christ; Sixty Sermons on Various Subjects*, 2 vols.

PARSONS, SAMUEL HOLDEN, 1737–89, b. Conn., son of the Rev. Jonathan Parsons. After graduating at Harvard college, 1756, he studied law at Lyme, Conn., with gov. Matthew Griswold, his uncle; began practice in Lyme, 1759, and for many years represented the town in the colonial assembly. In 1774 he removed to New London, and was made prosecuting or king's attorney. At the outbreak of the revolution he took command of the 6th Connecticut regiment, was present at the battle of Long Island and the siege of Boston, and for his services was promoted to the rank of brig.gen.; in 1779 he became

Putnam's successor in the command of the state militia, and in 1780 was made a maj. gen. At the close of the war he opened a law office in Middletown, Conn. Congress in 1785 appointed him a commissioner to treat with the Miami Indians, and a few years later he negotiated the treaty between Connecticut and the Indian tribes about lake Erie, by which the claim of the latter, to what became known as the Connecticut western reserve, was extinguished. In 1787 he headed a New England colony which settled on the reserve near the Ohio river. He published a paper on the *Antiquities of the Western States* in vol. 2 of the *Transactions of the American Academy.*

PARSONS, Theophilus, ll.d., 1750–1813, b. Mass.; graduated at Harvard in 1769, and was admitted to the bar in 1774. He began the practice of his profession at Falmouth, now Portland, Maine, which was laid waste by a British squadron in Oct., 1775; and Parsons, whose prospects for professional success at Falmouth were ruined by this disaster, withdrew soon afterward to Byfield, his native town. There, for some years, he studied in the library of Judge Edmund Trowbridge, then the first jurist in New England, and whose collection of law books was at that time perhaps the most complete in this country. Parsons finally removed to Newburyport, where he soon acquired an extensive practice; and for some ten years he exerted a considerable influence in public affairs. In 1778 he was active in the discussion of the new constitution of Massachusetts, then recently framed by the legislature. Parsons was strongly opposed to the adoption of that instrument; he was a member of the "Essex Junto," which comprised a large number of the citizens of Essex co. hostile to the new constitution; and the pamphlet called *The Essex Result,* and which had a great influence in bringing about the defeat of the new constitution, is attributed to him. In 1779 he sat in the convention which drew up the constitution which, with some changes, still subsists in Massachusetts. In 1788 he was a member of the state convention called to act upon the adoption of the federal constitution. He warmly supported the latter, and the so-called "Proposition" in favor of its adoption, though offered by John Hancock, was drawn up by Parsons. Besides serving from time to time in the legislature, this was his last appearance in public life. He settled in Boston in 1800, and continued his law practice, which had long included causes from all parts of New England. From 1806 till his death he was chief justice of the state supreme court. His judicial opinions have not been as fully reported as could be desired, but those preserved in the early Massachusetts reports, and in his *Commentaries on the Law of the United States,* show great ability and learning, especially in the departments of real property and marine insurance. He was expeditious in the dispatch of business, and thoroughly conversant with the old common law system of pleadings. In politics he was a federalist in principle, but after his elevation to the bench, punctilious to take no share in them.

PARSONS, Theophilus, ll.d., b. Mass., 1797; son of Chief Justice Parsons. He graduated at Harvard in 1815, was admitted to the bar, and began to practice in Taunton. Soon afterward he removed to Boston, where he became the founder and editor of the *United States Literary Gazette.* He also contributed regularly to the *North American Review.* In 1847 he was appointed Dane professor of law at the law-school of Harvard university, where he remained for a quarter of a century. Dr. P. published a number of treatises on legal subjects. His *Law of Contracts,* which has become a standard work upon its subjects, and has gone through many editions, appeared in 1853, and was followed by *Elements of Mercantile Law,* 1856; *Laws of Business for Business Men,* 1857; *Maritime Law,* 1859; *Notes and Bills,* 1862; *Law of Partnership,* 1867; *Marine Insurance and General Average,* 1868; *Shipping and Admiralty,* 1869; and *Political, Personal, and Property Rights of a Citizen of the United States,* 1875. He was a Swedenborgian, and he produced a number of works maintaining the doctrines of the New Jerusalem church. The most important are his *Essays,* in 3 series; *Deus Homo,* 1867; and *The Infinite and the Finite,* 1872. He d. 1882.

PARSONS, Thomas William, b. Boston, 1819; educated at the Boston Latin school. He went to Italy in 1836, and carefully studied Italian literature, particularly the works of Dante, a translation of the first 10 cantos of whose *Inferno* he published in 1843. Returning to Boston, he took a medical degree at the Harvard medical school, and for some time practiced dentistry. For a number of years he lived in England, and afterward in Italy. He published in 1854 a collection of poems under the title of *Ghetto di Roma,* and a translation of the *Inferno* in 1867. His other works include *The Magnolia, The Old House at Sudbury, The Shadow of the Obelisk* (all poems), and *Circum Præcordia.* He occasionally contributed to the *Catholic World* and other periodicals. He d. in 1892.

PARSONS, Usher, 1788–1868; b. Maine; received an ordinary education, and studied medicine under Dr. John Warren, of Boston. In the war of 1812 he entered the naval service as surgeon's mate and was acting surgeon of Perry's flag-ship, the *Lawrence,* and in that capacity was present at the battle of lake Erie, Sept. 10, 1813. He remained in the navy until 1822, was present at the attack on Mackinac, and after resigning his commission practiced his profession at Providence, R. I. He became a professor in Brown university medical school, president of the state medical school, and first vice-president of the national medical association. He published a life of sir Wm. Pepperell,

1856, several medical works, and a number of biographical sketches and speeches connected with the events of the battle of lake Erie.

PARSONSTOWN (anciently called BIRR), a considerable inland t. on the river Brosna, in King's county, Ireland, 43 m. n.e. of Limerick, with which city it is connected by a branch line issuing from the Great Southern and Western railway at Ballybrophy. Pop. '91, 4,313; of whom the great majority were Roman Catholics. Birr had its origin at an early period in a monastery founded by St. Brendan, and was the scene of many important events, both in the Irish and in the post-invasion periods. The castle, which was anciently the seat of the O'Carrols, was granted by Henry II. to Philip de Worcester; but it frequently changed masters, and even alternated between English and Irish hands. By James I. it was granted to Lawrence Parsons, ancestor of the present proprietor, the earl of Rosse; but through the entire period of the civil wars, its possession was constantly disputed, until after 1690, when the Parsons family was finally established in possession. About this time Birr returned two members to parliament, but the privilege was temporary. The castle has been rebuilt. Parsonstown is one of the handsomest and best built inland towns in Ireland, with several fine churches and chapels, a nunnery, a statue of the duke of Cumberland, a bronze statue (erected in 1876) of the earl of Rosse, a town-hall, a library, literary institute, a model and other schools. But the great attractions of Parsonstown are the castle, the observatory containing a great telescope 52 feet long, and the laboratory of the late earl of Rosse (q.v.), still maintained in active use by the present earl. Parsonstown is an important corn-market, a considerable center of inland commerce; but with the exception of a distillery and brewery, it is almost entirely without manufactures. It is a military station, and the seat of a union workhouse.

PÂRS'WANÂTHA, the twenty-third of the deified saints of the Jainas, in the present era. He and *Mahavîra,* the twenty-fourth, are held in highest esteem, especially in Hindustan. In a suburb of Benares called Belupura, there is a temple honored as the birthplace of Pârswanâtha. See JAINAS.

PART, in music. When a piece of music consists of several series of sounds performed simultaneously, each series is called a part.

PARTANNA, a market t. of the island of Sicily, in the province of Trapani, 38 m. s.w. of Palermo. Pop. 13,144.

PARTERRE, in gardens laid out in the old French style, the open part in front of the house, in which flower-beds and closely-cut lawn were intermingled according to a regular plan.

PAR'THENOGEN'ESIS (from the Gr. *parthenos,* a virgin, and *genesis,* the act of production) is a term invented by Prof. Owen to indicate propagation by self-splitting or self-dividing, by budding from without or within, and by any mode save by the act of impregnation; the parthenogenetic individuals being sexless or virgin females. See the article GENERATIONS, ALTERNATION OF. For many remarkable facts in relation to parthenogenesis in insects, the reader is referred to Prof. Owen's 18th lecture, *On the Comparative Anatomy and Physiology of Invertebrate Animals;* and to Siebold, *On Parthenogenesis,* translated by Dallas.

This term, as employed by Prof. Owen and applied, as noticed in the preceding remarks, to the processes of gemmation and fission as exhibited in sexless beings or virgin females, is not strictly the generative process which is now indicated by its use. The term is now confined to the generation of new individuals from the development of *ova* by virgin females without contact with the male element. The peculiarity of this process is appreciated by regarding the proper definition of an ovum, and its distinction from an internal bud. An ovum is usually contained in an ovary, and always has a germinal vesicle and a germinal spot, and during its development undergoes what is known as segmentation of the yelk. Examples of true parthenogenesis are seen in certain plant-lice (*aphides*), the honey-bee, and some of the lower and smaller crustaceans, as now classified. In the autumn, plant-lice consist of males and females, which by sexual union produce ova; but these remain dormant during the winter. In the spring they are hatched, but, instead of producing males and females, the young are all of one kind, variously regarded as neuters, females, or hermaphrodites. These oviparous products, whatever their nature may be, now produce viviparously a *brood* of young resembling themselves, these in turn bringing forth a third generation; and the same viviparous process may be repeated a considerable number of times during the summer. The last generation, however, brought forth at the commencement of autumn will not be all of one kind, but will consist of distinct sexes. Now sexual reproduction by means of eggs takes place, as in the preceding autumn, to be followed in the spring by another series of viviparous generations. The viviparous multiplication of the aphides is multitudinous, and it has been estimated that ten generations of a single aphis during one summer may reach the number of one quintillion. The ovary of each viviparous aphis resembles that of a fertile female, with certain exceptions which cannot well be described here. It may be regarded as a pseudo-ovary, and it generates or develops eggs or "pseudo-ova," which, without male intervention, are developed into young aphides. There is no anatomical difference between the pseudo-ova and true ova, the

distinction being purely physiological. Some naturalists, however, maintain that the viviparous aphides are hermaphrodites, possessing both sexual elements, in which case their mode of generation would not be an example of parthenogenesis; but this view is not entertained by most observers. In regard to certain reproductive phenomena among honey-bees there seems to be but little doubt. There are three classes of individuals in a hive of bees; a *queen*, or fertile female; *workers*, forming the bulk of the community and which are examples of arrested development in females; and, thirdly, the *drones*, or male bees, produced at certain times of the year. The wonderful impregnation of the queen, which occurs during her "nuptial flight," results in the storing up of fecundating material in a receptacle which communicates by a tube with the oviducts, and which material, it is said, can be used at will, or at least is used periodically, as occasion requires. The ova which become undeveloped females, or workers, are fertilized during their passage through the oviduct; and the subsequent development of these fecundated ova into queens or into workers, as the case may require, depends upon the form (seemingly) of the cell which receives the ovum, and upon the food which is given to the larva. There is nothing in the evidence so far produced to show non-sexual generation; but careful observers have succeeded—by preventing, as they assert, the contents of the seminal receptacle of the queen from passing into the oviduct, and thus coming into contact with the ovum—in causing her to produce none but males, or drones. If these observers are correct, this case is one of parthenogenesis; and at present the prevailing tendency is toward the acceptance of their conclusions.

PAR'THENON, the temple of Minerva at Athens; one of the most celebrated of the Greek temples, and usually regarded as the most perfect specimen of Greek architecture. Many of the sculptures have been brought to England, and are now in the British museum. See GRECIAN ARCHITECTURE; ELGIN MARBLES.

PARTHENOPE'AN REPUBLIC (from *Parthenope*, the oldest name of the city of Naples) was the name given to the state into which the kingdom of Naples was transformed by the French Republicans, Jan. 23, 1799, and which only lasted till the following June, when the invading army was forced to retreat.

PAR'THIA, anciently a country of western Asia, lying at the s.e. end of the Caspian sea, from which it was separated by a narrow strip, known as Hyrcania, now forms the northern portion of the province of Khorassan, and is an almost wholly mountainous region. Its rivers are merely mountain torrents, which are supplied by the melting snow on the Elburz range during winter and spring, but are mostly dry in summer and autumn.

The original inhabitants are believed to have been of Scythian race, as shown by their language as well as by their manners, and to belong to the great Indo-Germanic family. If this be the case, as is very probable, the term Parthian, from its analogy to the Scythian word *parthe*, banished, seems to indicate that they were a tribe who had been driven to Parthia out of Scythia (i.e., central Asia). The Parthians during the time of the Roman republic, were distinguished by primitive simplicity of life and extreme bravery, though at the same time much given to bacchanalian and voluptuous pleasures. They neglected agriculture and commerce, devoting their whole time to predatory expeditions and warfare. They fought on horseback, and after a peculiar fashion. Being armed solely with bows and arrows, they were rendered defenseless after the first discharge; and, to gain time for adjusting a second arrow to the bow, turned their horses, and retired, as if in full flight, but an enemy incautiously pursuing, was immediately assailed by a second flight of arrows; a second pretended flight followed, and the conflict was thus carried on till the Parthians gained the victory, or exhausted their quivers. They generally discharged their arrows backward, holding the bow behind the shoulder; a mode of attack more dangerous to a pursuing enemy than to one in order of battle. The Parthians first appear in history as subject to the great Persian empire. After the death of Alexander the Great, Parthia formed part of the Syrian kingdom, but revolted under Antiochus II., and constituted itself into an independent kingdom under the *Arsacidæ* (see ARSACES), 250 B.C., a race of kings who exercised the most completely despotic authority ever known, treating their subjects as if the vilest of slaves; yet so accustomed did the Parthians become to this odious rule, that some of the later monarchs, who had received a Roman education, and after their accession treated their subjects with ordinary justice and humanity, were completely despised. The capital of the Parthian monarchy was Hecatompylos ("the city of the hundred gates"), now Damgan. The Parthian dominion rapidly extended to the Euphrates on the w. and the Indus on the e., and became a most powerful and flourishing empire; Seleucia, Ctesiphon—the capital of the Persian emperors of the Sassanidæ—and other celebrated cities date their rise from this period, and soon eclipsed, in size and splendor, the ancient Hecatompylos. In spite of repeated attacks on the part of the Romans, the Parthians maintained their independence (see CRASSUS, MARCUS); and though Trajan, in 115–116 A.D., seized certain portions of the country, the Romans were soon compelled to abandon them. In 214 A.D., during the reign of Artabanus IV., the last of the Arsacidæ, a revolt headed by Ardshir, son of Babegan, broke out in Persia, and the Parthian monarch, beaten in three engagements, lost his throne and life, while the victor substituted the Persian dynasty of the SASSANIDÆ (q.v.) for that of the Arsacidæ. Some scions of the Parthian royal

family continued for several centuries to rule over the mountainous district of Armenia, under the protection of the Romans, and made frequent descents upon Assyria and Babylonia; but their history is obscure and of little importance.

PARTIAL LOSS, in the law of marine insurance, is a loss which is not total; and therefore the insurer is not entitled to abandon or give up the remains of the ship or cargo, and claim the entire insurance money; but he is bound to keep his ship or goods, and claim only in proportion to his actual loss or damage.

PAR'TICIPLE (Lat. *participium*, part-taking), the name of a class of words which have the meaning of a verb with the form of an adjective. The name is said to have been given from their partaking of the nature both of a verb and of an adjective. Some grammarians make the participle a distinct part of speech, but it is more commonly classed as a part of the conjugation of the verb. There are in English two participles, one in *ing*, usually called the present, but properly the imperfect, because it expresses continued, unfinished action, e.g., *loving, writing;* and the other expressing past action, and ending either in *ed* (*t*) or in *en*, e.g., *loved, written*. In Ang. Sax. and old Eng., the imperfect participle ended in *and*, e.g., *haband* (having), corresponding to the modern Ger. *habend*, Gr. *echont* (os), Lat. *habent* (is). In the sentence, "he is *writing* a letter," *writing* is the imperfect participle; in "the *writing* of the letter occupies him," or "*writing* is a difficult art," it is a substantive, and had a different origin. In the latter case, *-ing* corresponds to the Ang. Sax. termination *-ung*, used in forming substantives from a large class of verbs; thus, Ang. Sax. *halgung* (hallowing) is equivalent in meaning and in etymology to Lat. *consecratio;* similarly, modern Ger. *Vernichtung*, annihilation, from *vernichten*, to annihilate. Such a phrase as, "while the letter is writing," seems to be a shortened form of the now antiquated, "is a-writing," which was originally, "is in writing." Although this mode of expression is liable in some cases to ambiguity, it is terser and more idiomatic than the circumlocution of, "is being written," which is often substituted for it. The verbal substantive in *-ing* is often exactly equivalent to the infinitive; thus, "*standing* long in one position is painful" = "*to stand*," etc. It has this advantage, that while it can be construed as a noun (e.g., with a possessive case), it can retain at the same time the usual adjuncts of a verb; as, "what are we to infer from the king's dismissing his minister?" The use of this form contributes not a little to the peculiar brevity and strength of the English language.

PARTICK, a t. of Scotland, in the co. of Lanark, prettily situated, chiefly on a rising ground on the Kelvin, immediately above its junction with the Clyde, and about 2 m. w.n.w. of the cross of Glasgow, of which city it now forms a suburb. Nine-tenths of the workmen of Partick are engaged in ship-building, and there are numerous ship-building yards, flour mills, cotton factories, and bleach-fields. A large proportion of the inhabitants are engaged in business in Glasgow, and for their accommodation extensive ranges of handsome villas have been built here. Pop. '51, 3,132; '61, 8,183; '81, 27,410; '91, 36,538.

PARTINICO, SALA DI, a post-town of Sicily, in the province of Palermo, and 14 m. s.s.w. of the city of that name, at the foot of a grand precipice of red limestone. The plain in the vicinity is of surpassing fertility; corn, wine, oil, fruit, and sumach are produced in rich abundance: and linen and woolen goods are manufactured. Pop. abt. 21,000. Scattered vestiges of ancient habitations are still to be seen on the summit of the height above the town, and are said to be the ruins of the ancient *Parthenicum* mentioned in the *Itinerary* of Antoninus, and there only.

PARTISAN is a name for a halberd or pike, or for a marshal's baton. The name is also given to the leader of a detached body of light troops, who make war by harassing the enemy, rather than coming to direct fighting, by cutting off stragglers, interrupting his supplies, and confusing him by rapid strategy. The action of such a corps is known as *partisan warfare.*

PARTITION, a thin interior wall dividing one apartment from another. It is usually of brick-work, 4½ or 9 in. thick, or of timber with standards about 4½ in. thick, covered with lath and plaster. Wooden partitions are used when there is no sufficient support for brick. When these have to carry joists or any other weight they ought to be constructed in the form of a truss (q.v.).

PARTITION, the division by co-parceners, joint tenants, or tenants in common, of their undivided interests in lands, tenements, or hereditaments, or in goods and chattels. Technically the term is restricted to the severance of common interests in real estate, by the persons above named. Estates in co-parcenery were created by operation of law, when one estate fell to two heirs: thus, where the tenant of an estate in fee died without male heirs, his estate devolved upon his daughters or female representatives, who took as co-parceners. A dissolution of such a joint-estate would be compulsory at the common law, upon request of a single co-parcener, because the creation of the joint-estate was compulsory. But estates in joint-tenancy and tenancy in common were created by voluntary act of the parties and could be dissolved only in the same way. The common-law rule was finally changed by statute, so that since the reign of William IV. all estates in common have been subject to partition. Joint-tenancy has been generally abolished in the United States, so that tenancy in common is practically the only

form of joint-ownership found in this country. But heirs and devisees holding the estate of a deceased ancestor, in common, have still to resort to partition. Partition is either compulsory, i.e., without reference to the consent of one or more of the owners; or voluntary, i.e., by consent of all the owners. The former is effected by the suing out of a writ of partition at common law, by the party demanding partition, or by bringing a partition in a court of equity. A voluntary partition is secured by a mutual release by all the other owners to every owner of the share which is to vest in him. It is always more advantageous, and is now more common to seek partition in a court of equity. A law court can make a severance only in accordance to the proportionate interests of the parties; and such a division is often injurious to the interests of some of the parties. A court of equity does not confine itself to the allotment of equal shares, but makes an equitable division, giving each party the portion which seems best adapted for his interests, and if necessary making one party an equitable compensation for improvements made in the common property. Where a petitioner's title is disputed, equity will not interfere, and he must establish it at law. "Partition in law and at equity," says lord Redesdale, "are very different things. The first operates by the judgment of a court of law and delivering up possession in pursuance of it, which concludes all the parties to it. Partition in equity proceeds upon conveyances to be executed by the parties, and if the parties be not competent to execute the conveyance, the partition cannot be effectually had." A written agreement for a partition as held by equity is equivalent to a partition, and will be enforced. A parol partition has been held void, notwithstanding an actual possession in severalty; but it has been held that where a tenant in common has had actual adverse possession for a number of years, partition will be inferred. A parol partition will be held good notwithstanding the statute of frauds, if there have been a several possession for some time, and the line of partition is certain. A partition of real estate by quit-claim deed is valid between the grantee of a tenant in common and his co-tenants. As a rule, a person must have actual seisin to maintain proceedings for partition, but a tenant in common need have only a right of entry. No partition can be had of land to which the parties have only a title in remainder, or where the title is vested in a third person, as a trustee. A tenant in common of personal property cannot maintain a bill for partition, while another has adverse possession. The owner of an undivided interest cannot claim partition of part of the land held in common, but if division be made, the whole must be divided. When proceedings for partition are brought, every person not a plaintiff having an interest in the land, must be made a plaintiff. In many states special proceedings for partition have been established by statute, and particular courts, frequently courts of probate, are given jurisdiction over partition. The limit of the interest of the several parties is first fixed by a hearing, and thereupon the court appoints commissioners to make the severance and allotment, their acts being subject to the revision of the court. If no equitable division of the land can be made, it is to be sold at public auction, and the proceeds divided among the owners according to the order of the court, which will protect the rights of all parties in its decree.

PARTITION, or PARTITURA, in music. See SCORE.

PARTITION LINES, in heraldry, lines dividing the shield in directions corresponding to the ordinaries. According to the direction of the partition lines, a shield is said to be party or parted per fess, per pale, per bend, per cheveron, per saltire; a shield divided by lines in the direction of a cross, is said to be quartered; and a shield parted at once per cross and per saltire, is said to Gironné (q.v.) of eight. The partition lines are not always plain; they may be engrailed, invected, embattled, wavy, nebuly, indented, dancetté or raguly—forms which will be found explained under separate articles.

PARTNERSHIP, in the law of England, is the union of two or more individuals acting under a contract, whereby they mutually contribute their property or labor for the purpose of making profits jointly. When a partnership is confined to a particular transaction or speculation, it is usually called a joint-adventure, and the parties are joint-adventurers. The usual criterion by which a partnership is ascertained to exist, as distinguished from other arrangements, is that there is a community of profit; it is not essential that both should suffer losses equally or proportionably, for one partner may stipulate that he shall not be liable to loss. This stipulation is binding between the partners, but of course is insufficient to prevent the partners from being all liable to third parties. So one partner may contribute all the capital or all the labor. A dormant partner is one whose name does not generally appear to the world as a partner, but who nevertheless is to all intents and purposes a partner, with equal rights and liabilties to the rest. In order to constitute that kind of community of profit which is the chief ingredient in a partnership, it is necessary that the partner share in the profits as a partner; for in many cases, clerks, servants, or agents receive a commission or remuneration proportioned to profits, and yet are not partners, for this is merely one mode of ascertaining the salary which they are to receive. In all such cases, therefore, the distinction as to whether there is a partnership or not turns on the consideration whether the alleged partner receives a share of the profits, as such, or merely receives a salary proportioned to profits, without having a specific interest in the firm. The contract of partnership may be entered into either by word of mouth or in writing. If no specified

term be agreed upon, it is a partnership at will, and may be dissolved by either of the parties at pleasure. Sometimes, also, the court of chancery will interfere to dissolve the partnership before the time appointed; but this only happens when some unforeseen and urgent reason exists, as that one of the partners has become a lunatic, or has proved grossly dishonest, or the object of the partnership cannot be carried out. Mere differences of opinion on minor matters are no ground for seeking a dissolution. The partners may make any kind of arrangement between themselves that they think proper; but if these are unusual and special stipulations, there is no certainty of securing the same being adhered to, without a formal deed or indenture of partnership being executed. Thus, it is common to stipulate as to the capital each is to contribute, and as to the proportion of profits he is to receive, as what is to be done in case of the death of a partner, etc. Unless a stipulation is made to the contrary, the rule is, that the death of one of the partners dissolves the partnership. So does his bankruptcy. It is also a rule that no new partner can be introduced without the consent of the rest. There was once a peculiarity in the law of England as to the form of remedy—the rule being, that partners cannot sue each other in a court of law in respect of partnership transactions, but the only remedy is by a bill in chancery. As against third parties, whatever may be the secret arrangements between themselves, the rule is, that any partner can bind the firm in all matters which are within the scope of the partnership, each being by the nature of the contract made the agent of all the rest for business purposes. Thus, any one may accept a bill in the name of the firm, provided such be one of the modes of doing business. It is, however, to be borne in mind, that the firm is only bound by one of the partners in those matters which are strictly within the proper business of the firm, which is an important qualification of the general power. Within the above limits, each partner can bind the rest of his co-partners, however imprudent or foolish may be his act, for it is one of the implied conditions, that all have full confidence in each other. It follows from this principle, that the firm is liable for the dealings of each partner on its behalf within the scope of the partnership, and each is liable to the full extent for all the debts of the firm; in short, each is liable to his last shilling for the solvency of the firm. Hence, it is often of importance for a partner, on leaving the firm, to know how to terminate this liability. The rule is, that as regards all strangers, a notice in the *Gazette* is good notice; but as between the firm and those who have had dealings with it, the *Gazette* notice is of no use, unless it can be proved that the party had actual notice given to him—and hence a circular-notice sent to customers announcing the fact of retirement, is the only course effectual.

The practice of individuals entering into large associations, now called joint-stock companies, which were originally only extended partnerships, has led to a separate code as to these being framed for the United Kingdom. See JOINT-STOCK COMPANIES. The practice of limiting the liabilities of partners or shareholders in joint-stock companies had of late years led to the belief that a similar restriction might well be extended to ordinary partnerships, and accordingly a bill was introduced into parliament in 1864 to enable this to be done. But that view was not carried out except to a limited extent, though an attempt was made to simplify some of the rules as to partnership liability, which are somewhat perplexing. It had long been matter of complaint that every man who had a share of the profits of a trade was said to be liable also to bear his share of the loss; whereas by lending money at a fixed rate of interest he was a mere creditor and could be exposed to no risk but the loss of his advance. The house of lords, however, in 1860, had held it to be a mistake to suppose that a person who advanced money on terms of sharing profits was necessarily a partner. To remove part of the difficulty, however, an act of 28 and 29 Vict. c. 86 was passed, which enacts that if advances are made by written contract to a person in trade on terms of sharing profits, that of itself will not make the lender a partner. Nor will the payment of a servant or agent by a share of profits, nor the receipt by a deceased partner's widow or child of part of the profits as annuity, make any of these a partner. But the benefit of this act was confined in most cases to written contracts, and thus the old law remains as to other cases. It is still the law that a person, not a partner, becomes liable as one, if he has either represented himself as a partner, or authorized another so to represent him; and the third person dealing with the firm must have known this representation to enable him to hold the dormant partner liable. In 1870 a bill was passed "to facilitate compromises and arrangements between creditors and shareholders of joint-stock and other companies in liquidation," but these points do not call for notice here.

In Scotland the law of partnership, though in its essential features the same with the law of England, differs in one or two particulars. The partnership is treated as a distinct person in law, the partners being only its sureties or cautioners; and the consequence of this is, that in actions by or against the firm, the individual partners need not be named, though in practice one or two of them generally are named. Each partner may also sue the firm as if it were a distinct person; and the firm may be made bankrupt without any of the partners being sequestrated. See Paterson's *Comp of E. & S. Law*, p. 214,

Partnership in American law, is defined by Kent as "a contract of two or more competent persons, to place their money, effects, labor, and skill, or some or all of them in

lawful commerce or business, and to divide the profit and bear the loss in certain proportions." *What constitutes a partnership:* There must be an agreement to carry on some business for the purpose of profit, and that the parties to the agreement shall share the profit. The association of a number of persons for the purpose of carrying on business for the sake of profit may not be a partnership, but a corporation differs from a partnership in this, that though composed of a number of persons, it performs its acts as a whole; and its rights and liabilities are as those of a single person, and not as those of the persons of whom the corporation consists. The rights and liabilities of a partnership, on the other hand, are those of the individual partners. A partnership differs, on the other hand, from a joint tenancy, or tenancy in common. A common interest in the profits is absolutely essential to constitute a partnership. An agreement for a community of profits is *primâ facie* an agreement for a partnership. An agreement to share profits is *primâ facie* an agreement to share losses, though the agreement says nothing of losses; and wherever a community of profits is shown, the existence of a partnership is not necessarily negatived even by a positive stipulation against community of loss. Parties not actually partners are made liable as such, by law in two cases. The first case, resulting from the principle of estoppel, is where non-partners have acted in such a way as to make other persons suppose they actually are partners. The second case of partnership as to third persons arises from sharing profits. An instance of this is where a person in the service of others, receives not a salary, but a share in the profits. Both these partnerships as to third persons are known as *quasi* partnerships. Every person who has a share in the profits of the business, is *primâ facie* a partner as to third persons; and if he have never represented himself as a partner, he may show that he is not a partner as to the others. The question as to what kind of community in the profits will charge a person as a partner in respect to third persons has given rise to many subtle distinctions. There is a series of cases in which it is held that the right to demand an account of profits is the test whether a person be or be not a partner. But it appears from the 5 Gray, 58 (Mass.), and elsewhere, that though every partner has a right to demand an account, every person who has a right to demand account is not necessarily a partner. Another series of cases hold that only a party who has a specific interest in the profits as principal trader, is chargeable as a partner. Other cases again hold that a participation in the *net* profits charges a man as partner, but not a participation in the gross profits. The cases are not uniform upon this point. At present, however, whether there be a partnership or not, depends upon the intention of the parties. Each partner is regarded both as principal and agent in relation to the other partners.

Essentials of the formation of a partnership: 1. The association must be voluntary. 2. The purpose must be some lawful business. 3. The persons must be competent to contract. By common law any number of persons might form a partnership, but some English statutes restrict the number. 4. There must be a contribution of capital or skill. Good credit may be equivalent to capital. 5. The parties must be to each other as principal and agent. 6. The result aimed at must be mutual profit, and generally there is some agreement as to the distribution of profits. In a case where there was no special agreement, lord Eldon thought there should be an equal division, but the opinion of lord Ellenborough on the same case at *nisi prius* seems better, i.e., that it was a question for the jury what is a reasonable share. A partnership may be either *actual or ostensible.* If actual partnership exist, though not ostensible, as in the case of dormant partners, the liability to third persons exists. So if a person be an ostensible, though not an actual partner, he is liable.

Classes of partnership: 1. General.. 2. Special. 3. Limited as to liability. This exists only by statute. 4. Joint stock companies. No one can become a member of the firm without the consent of *all* the parties. But one partner may sub-divide his share without the consent of the others. The parties may stipulate to admit certain parties in future, e.g., the representatives of a partner in case of his death during the partnership. A court of equity will not ordinarily enforce an agreement of partnership; it will leave to the party this remedy at law for breach of the contract. Whether a partnership exist or not, is a question of fact, in determining which the sharing of the profits is merely evidence, but no fact makes a partnership by operation of law as formerly. Co-partners are thus distinguished from co-owners: a co-owner owns only part of property absolutely; co-partners have an interest in the whole. An agreement to buy property together does not constitute a partnership, but an agreement to buy and sell does. Written proof is required by the statute of frauds in a partnership in real estate. A firm may assume any name, and even different names at the same time; but if any man's name be used with his knowledge, or if he otherwise hold himself out as a partner, he is liable to those who directly or indirectly learn the fact, and act on it. But his liability does not apply to his executors or administrators. A firm cannot use the name of another the same as its own if such use be liable to deceive. But no generic name, or name of country, or product, can be the subject of private property. According to the modern law, partnerships may be formed for any business that an individual may pursue. But a distinction is taken between the right to carry on a business forbidden by law, and the right of partners to recover the proceeds of such business from each other The act of partners often occurs in one country while the firm is in another; the

legality of the action is determined by the law of the country where the act is performed. The powers of a partnership are usually expressed in articles, and the powers of the majority are limited by the articles, or by the main purpose of the partnership. In dealing with third persons, each partner has all the power of the firm. Each partner is the unlimited agent of the others in every matter connected with the partnership business, or which he represents to be partnership business, and which is not by its nature outside of such business. But in legal proceedings a partner cannot confess judgment for his co-partner; the whole firm must confess. He cannot submit a controversy of the firm to referees without consent of the other partners, although the firm's attorney can submit the firm's case to referees. A partner cannot execute a sealed instrument for the firm; but where a seal is unnecessary by law, or in settlement of debt or release, he may execute such an instrument. But an authority on the part of the other partners to execute a sealed instrument will be readily implied by the court. A partner may appoint agents and fix their compensation. He cannot charge, however, for his own services. Unanimity of partners may change any condition in the partnership business, even its nature. Each partner has a lien on partnership property for payment of partnership debts, and of his proportion. As a consequence all real estate is treated as personal property. Creditors may disregard partner's lien and pursue other remedies. Partners may convert partnership property into private property, and so discharge it from lien. In the United States in the absence of agreement to the contrary, partners are held entitled to equal shares in the profits. No allowance is to be made for an excess of capital paid in, or charge for excess withdrawn. Apart from the action of account, there is no action at law pending the partnership in regard to partnership affairs. A partnership may be dissolved by the act of God, as the death of one of the partners; by mutual consent of the parties; by an assignment of the partnership property for the benefit of creditors; by the assignment of a partner's interest to his co-partner or another; by act of the law, as the bankruptcy of a partner; by the marriage of a female partner; by the lapse of the time for which the partnership was formed; by the completion of the business for which the partnership was formed; by war between the different states in which the partners live, and by the award of arbitrators appointed under the articles of partnership. Lunacy of one of the partners does not itself dissolve the firm, but upon clear evidence of incurable insanity a court of equity will decree a dissolution. A partnership may be dissolved by decree in cases of gross carelessness or willful fraud, or where there are permanent dissensions between the parties of such a nature as to prevent their carrying on the business. Dissolution ends all transactions between the parties except for taking an account and winding up the business. The power of the partners still continues for some purposes; as to pay the partnership debts out of the partnership funds, to carry out the engagements of the partnership, and to convert all the partnership assets for the benefit of the partners. The liability of partners as to third persons continues till actual notice of the dissolution is served upon the latter, if they have had previous dealings with the firm; for other persons, notice in the newspapers is sufficient. Notice of the retirement of a dormant partner need be given to only such creditors as know of his being a partner. The class of partnerships known as "limited" is allowed by statute in most of the American states. They consist of one or more partners, called general partners, whose liability is unrestricted, and one or more special partners with a liability restricted to the amount of capital furnished by each.

PARTON, James, b. England, 1822; went to New York while young, and received his education at an academy in White Plains, N. Y.; where about 1841 he began to teach. He followed this profession for some years, teaching also in New York city and Philadelphia, and then entered upon a literary career, by joining the staff of the New York *Home Journal*, with which paper he continued three years. In 1855 he published his *Life of Horace Greeley;* and in 1857 his *Life of Aaron Burr.* The latter work established for him a reputation as a brilliant writer of biography, and became very popular. It was followed in 1859–60 by his *Life of Andrew Jackson*, a more ambitious work, and which tended to confirm the popular impression with regard to him. He published also *Humorous Poetry of the English Language from Chaucer to Saxe; Biography of Franklin; General Butler in New Orleans; Famous Americans; Caricature and the Comic Art;* and a number of pungent monographs on political and other topics. He contributed frequently to the *North American Review*, *Atlantic Monthly*, and other periodicals; and also was a successful lecturer. He married, in 1856, Sara Payson Willis, sister of Nathaniel P. Willis, better known as "Fanny Fern;" and after her death, in 1872, married her daughter by her first marriage. He d. in 1891.

PARTON, Sara Payson (Willis), 1811–72; b. Maine; received her education in the school of Catharine and Harriet Beecher, in Hartford, Conn; and, in 1834, married Charles Eldridge, of Boston. Her husband died in 1846, leaving her with two children; and she married a Mr. Farrington, a Boston merchant, but the union proved short-lived. She now endeavored to support her children and herself by teaching, but was unsuccessful, and in 1851 made her first attempt in literature by sending sketches signed "Fanny Fern," to Robert Bonner, the publisher of the *New York Ledger.* These sketches were written in a vein and upon topics which secured public attention, and were widely

copied; and the immediate result was a lucrative engagement with Mr. Bonner, for whom she continued to write until her death. In 1853 she published a collection of her articles, under the title *Fern Leaves*, which had a large circulation, as many as 70,000 copies being sold. She also published *Ruth Hall, Rose Clark, Fresh Leaves*, and other novels and sketches. Soon after beginning to write for the *Ledger* she removed to New York, where she passed the remainder of her life. She married James Parton in 1856.

PART-OWNERS, in law, are persons who, without being partners, hold undivided shares of personal property. Their respective rights and interests differ greatly from those of partners; one cannot bind the others as their agent; but if there be such agency and authority to act for the other part-owners, it must be created in some other way; nor can it exist, nor its existence be inferred, from the fact of part-ownership. A part-owner can affect only his own undivided share of the property; he cannot place an incumbrance on the whole, or assign or dispose of the whole. The term part-ownership is ordinarily and almost exclusively applied to ownership in vessels. It is common for a vessel to be held by a number of persons, not as partners, but as part-owners. The vessel, in that case, is supposed to be divided into a number of equal shares. The various part-owners manage the vessel by, and delegate their interests to, a number of agents, of whom the principal are the ship's husband and the master. These officers have a wide authority under the maritime law to bind their principals in certain contracts. Thus the master can make contracts for supplies, uses, and repairs, when the ship is abroad; and if necessary may borrow money on the credit of the part-owners, or procure it by bottomry, or by a pledge of the cargo. As long as he acts within the scope of his authority the part-owners will be liable; and the ship itself is liable as a rule. The ship's husband is generally himself a part-owner. He is the agent of the owners to make repairs, and generally attends to the equipment and management of the ship. A majority of the part-owners have the right to use the ship for a particular voyage, against the will of the minority; but they must secure the latter, to the amount of their shares, against loss.

PARTRIDGE, *Perdix*, a genus of gallinaceous birds, of the family *tetraonidæ*, having a short, strong bill, naked at the base; the upper mandible convex, bent down at the tips; the wings and tail short, the tarsi as well as the toes naked, the tarsi not spurred. —The Common Partridge, or Gray Partridge (*P. cinerea*), is the most plentiful of all the game-birds in Britain, and becomes increasingly plentiful as cultivation is extended, whilst the range of the moorfowl is restricted. It is not found in the outer Hebrides. On the continent of Europe it is abundant in almost all districts suitable to its habits, from Scandinavia to the Mediterranean, and is found also in the n. of Africa, and in some parts of the w. of Asia. It varies considerably in size; those found in rich lowlands being generally the largest, and about 12½ in. in entire length; while those which inhabit poorer and more upland districts are rather smaller. The female is rather smaller than the male. The upper parts of both are ash-gray, finely varied with brown and black; the male has a deep chestnut crescent-shaped spot on the breast, which is almost or altogether wanting in the female. A variety called the mountain partridge has the plumage brown. The partridge is seldom found far from cultivated land. It feeds on grain and other seeds, insects and their larvæ and pupæ, and the pupæ of ants are generally the food sought at first for the young. The nest is usually on the ground, among brushwood and long grass, or in fields of clover or corn, and generally contains from 12 to 20 eggs. The young run as soon as they are hatched. Both parents show a very strong attachment to their young, and great courage in repelling assailants; they have also recourse, like many other birds, to stratagem, to draw off the most powerful and dangerous enemies, such as dogs, in another direction, fluttering close before them as if broken-winged, whilst the brood escape. Until the end of autumn, the parent birds and their brood keep together in a *covey;* late in the season, several coveys often unite into a *pack*, when it becomes much more difficult for the sportsman to approach them. The flight of the partridge is strong and rapid for a short distance, but it does not seem to be capable of a long-sustained flight. The eggs of partridges are often hatched, and the young birds reared, by the domestic hen, the chief requisite being a plentiful supply of ants when the birds are very young. Partridges thus reared become very tame, but they seldom breed in the aviary.—The Red-legged Partridge (*P. rufus*, or *caccabis rufus*, the genus or subgenus *caccabis* being distinguished by a rudimentary blunt spur on the tarsi) is a native of the s. of Europe and of the Channel islands, and is now also plentiful in some parts of England, particularly Norfolk and Suffolk, into which it has been introduced. It is rather larger than the common partridge, stronger on the wing, and less easily approached by the sportsman, whilst it is also less esteemed for the table. The upper parts are of a reddish-ash color; the throat and cheeks white, bounded by a collar of black, which expands in black spots on the breast; and the sides exhibit bars of black. The plumage is smooth.—Two other species, nearly allied to this, are found in some of the southern parts of Europe. India has a number of species. The habits of all the species much resemble those of the common partridge.—The name partridge is sometimes extended so as to include the species of *ortyx* (see Virginian Quail), and in South America is sometimes given to the tinamous.

PARTRIDGE, Alden, 1785–1854; b. Norwich, Vt.; graduated from the U. S. military academy, 1806, Dartmouth college, 1812, and was appointed 1st lieut. of engineers;

capt. in 1810. In 1813 he was appointed professor of mathematics at West Point, having been assistant professor for a year previous, and in September following became professor of engineering; afterward superintendent of West Point academy till 1818, when he resigned. In 1819 he went out as leader of the surveying party sent to the n.w. frontier of the United States to determine the boundary line. He was the founder of a military school at Norwich, Vt., in 1820, subsequently attached to Norwich university, of which he was made president. In 1822 he was appointed surveyor-gen. of Vermont, and was several times a member of the legislature. He gave lectures on military topics in the leading cities of the country, and established schools for military instruction in Portsmouth, Va., 1840; in Reading, Penn., 1850; and in Delaware and New Hampshire. In 1822 he published *An Excursion;* in 1827 *Letters on Education*, and on *National Defense; Journal of a Tour of Cadets*, etc.

PARTRIDGE, George, 1740–1828; b. Duxbury, Mass.; graduate of Harvard, 1762; studied divinity, and taught school at Kingston. In 1774–75 he was a delegate to the provincial congress. He was representative from his state 1775–79, a delegate to the continental congress 1779–82, and 1783–85; in 1780 and for several years sheriff of Plymouth county. At his death he left a large share of his estate for the advancement of religion and popular education.

PARTRIDGE BERRY, or Checker Berry, a genus of rubiaceæ (madder family), represented by one species in America, and one in Japan. The American species, *Mitchella repens*, named in honor of Dr. John Mitchell, a correspondent of Linnæus, and an excellent botanist of Virginia, extends from Canada to Mexico and South America. It is a small trailing evergreen, having a branching stem, a foot long, often more, usually covering the ground with a mat. Its favorite habitats are dry, sandy knolls in piney woods, but it may be found in most dry woods. Its leaves are smooth and shining, round-ovate, opposite with short petioles, and traversed with light lines; flowers in pairs with ovaries united; calyx four-toothed; corolla funnel-form, four-lobed; the lobes spreading densely bearded inside; white, tinged with rose or purple: fragrant; stamens four, style one; stigmas four, linear. Fruit, a beautiful scarlet berry crowned with the calyx teeth of the two flowers, each with four small seed-like and bony nutlets. The berry is about the size of that of the winter-green, but broader, and short; also varies, some of them being four times as large as others. They remain on the plant during the winter. Blossoms in June and July. The berries are often eaten, but are pitchy and rather tasteless, much inferior to the winter-green berry, which is also often erroneously called partridge berry.

PARTRIDGE BERRY. See Gaultheria.

PARTRIDGE PIGEON (*Geophaps*), an Australian genus of *columbidæ*, approaching more than most of the pigeons, in character and habits, to the true gallinaceous birds, and particularly to partridges. Their plumage is beautiful, and generally with a bronze tinge and lustre on the wings, which causes them to be sometimes called bronze-wings. There are several species. They live mostly on the ground, and rise with a whirring noise, like the pheasant when disturbed. They are highly esteemed for the table.—*Geotrygon montana*, a species of another genus of *columbidæ*, bears the name of Partridge Dove in the West Indies. It also seeks its food chiefly on the ground, although it affects well-wooded districts.

PARTRIDGES, in artillery, were very large bombards formerly in use at sieges and in defensive works. They are mentioned in Froissart.

PARTRIDGE-WOOD, a very pretty hard wood from the West Indies and Brazil; it is usually of a reddish color, in various shade from light to dark, the shades being mingled in thin streaks; but in some choice sorts they are curled upon one another so as to resemble the feathers of the partridge, whence its name. One variety occurs in which the colors are remarkably bright, and it is consequently called pheasant-wood. In Brazil, this beautiful wood is so plentiful that it is employed in ship-building, and it is said to be used in our navy-yards under the name of cabbage-wood, but this is doubtful; many woods are known as partridge, and several as cabbage-wood. Among the Brazilians, it is called "Angelim," and they describe four sorts—*Angelim de pedra* (the stone angelim), *A. vermelho* (red angelim), *A. amargoso* (bitter angelim), and *A. varzea* (cultivated angelim). Its chief use in this country is for cabinet-work, Tunbridge-ware, parasol-sticks, fans, and other small matters for which its beauty recommends it. It is said to be yielded by the leguminous tree (*Andira inermis*), which is found not only in the Brazils, but in other parts of South America and the West Indies.

PARTS of SPEECH are the several kinds or classes into which the words of a language are divided. There is nothing in the outward form of words that would enable us to divide them into classes. The distinction lies in the *offices* that the several words perform in a sentence (q.v.). All words performing the same office in sentences belong to the same class. The essential parts of speech are the noun, adjective, pronoun, verb, adverb, preposition, conjunction (see these several heads). The articles (q.v.) are not distinct parts of speech, being essentially pronouns; and interjections (q.v.) hardly belong to articulate speech. To name the class or part of speech to which each word of a sentence belongs is called to *parse* it.

PARTURITION. See MIDWIFERY.

PARTY, in Heraldry. See PARTITION LINES.

PARTY NAMES. The following is a list of the principal party nicknames that one meets with in reading the annals of American history:

Abolitionists: Applied originally to those in the north who desired the abolition of slavery; subsequently transferred to the republican party (q.v.). *Adamites:* The partisans of John Quincy Adams. An expression current from 1821–1832. *American Party:* The party that flourished about 1853 and took for its motto, "America for the Americans." Also known as the "Know-nothing party." *Anti-Federalists:* The earliest name for the democratic party (q.v.). *Anti-Masons:* A party that flourished from 1826–1840, because of the alleged murder of Morgan (q.v.) by the masons in 1826. *Anti-Nebraska Men:* A party formed in 1854 by whigs opposed to the Kansas-Nebraska bill (q.v.). *Anti-Renters:* A party flourishing in New York state in 1837–47 to oppose the collection of rent by the "Patroons" (q.v.). *Barnburners:* The radical wing of the democratic party in New York state in 1848, opposed to the hunkers (q.v.), and subsequently coalescing with the free-soil party. *Black Republicans:* A name given by the extreme democrats during the war to the republicans, as being friendly to the emancipation of the blacks. *Bourbons:* Originally applied to southern democrats of the old school, but now used of any reactionary who adheres obstinately to tradition, and like the Bourbons of France, "Learns nothing and forgets nothing." *Bucktails:* A New York state faction organized in 1815 to oppose Geo. Clinton's administration. The badge was a bucktail worn in the hat. *Burrites:* An independent faction of the democratic party headed by Aaron Burr (q.v.) in 1797. *Copperheads:* A name given by republicans during the civil war to those northerners who sympathized with the south. *Democrats.* See the article in vol. IV. *Doughfaces:* A name scornfully applied by John Randolph, of Roanoke, to those northern congressmen who aided the slave-owning interests by their votes. *Drys:* A nickname given to the prohibition party (q.v.). *Dutch:* A name given in 1842 to the democratic supporters of Van Buren. *Federalists.* See the article in vol. V. *Fire-Eater:* Equivalent to *Bourbon* (q.v.). *Free Soilers:* The early name of the republican party, assumed in 1848, or earlier. *Grangers.* See the article in vol. VII. *Greenbackers:* A party advocating the issue of an irredeemable paper currency, and active in 1870–78. *Half-Breeds:* The moderate wing of the New York republicans in 1880–1885. Opposed to the *Stalwarts* (q.v.). *Hunkers.* See BARNBURNERS. *Jacksonites:* Followers of Andrew Jackson (q.v.), and thus opposed to the *Adamites* (q.v.). *Know-nothings.* See article AMERICAN PARTY in vol. I. *Liberals,* or *Liberal Republicans:* The name adopted by the seceding republicans who opposed Gen. Grant's second election to the presidency, and supported Horace Greeley. *Loco-Focos:* A popular nickname for the democrats prior to 1860. See the article in vol. IX. *Loose Constructionists:* Those favoring a liberal interpretation of the constitution. *Mahoneists:* The followers of Gen. William Mahone, of Virginia, who seceded from the democratic party in 1878. See READJUSTERS. *Mossbacks:* A name given to the section of the democratic party of Ohio who followed the oldest leaders of the party. *Mugwumps:* See the main article in vol. IX. *Native Americans.* See AMERICAN PARTY. *Nullifiers:* Those who in 1832 advocated the right of a state to "nullify" the United States tariff law. *Prohibitionists:* The party favoring the abolition by law of the manufacture and sale of ardent spirits. *Radicals:* The extreme wing of the republican party. Opposed to liberals (q.v.). *Readjusters:* A local party headed by Gen. William Mahone, who favored a conditional repudiation of the Virginia state debt. *Republicans.* See the article in vol. XII. *Short Hairs:* A name for the rougher element of the democratic party in New York city. Opposed to *Swallowtails. Silver Greys:* The conservative section of the whig party (q.v.). *Stalwarts:* The "straight-out" wing of the republican party in New York state from 1880–1885, headed by Roscoe Conkling. *Strict Constructionists:* Those favoring a stringent interpretation of the constitution. *Swallowtails:* The aristocratic section of the New York city democracy. Opposed to *Short Hairs* (q.v.). *Unionists:* Southerners who during the civil war favored the preservation of the Union. *Washingtonians:* The early name of the prohibition party (q.v.). *Whigs.* See the article in vol. XV. *Wets:* A name for those opposed to the "drys" or Prohibitionists. See above. *White League:* An organization formed at the south to prevent the political ascendency of the negroes. *Yankees:* The popular name at the south for the unionists during the war. See also FARMERS' ALLIANCE; LILY WHITES; POPULIST PARTY.

PARTY-WALL is the wall dividing two houses or tenements, and which is, in a certain sense, one and indivisible, though the property of two or more parties. The question as to who is the owner of any particular part of the party-wall, is solved by ascertaining who is the owner of the soil on which it is built. In the absence of evidence to the contrary, it is presumed that half of the soil belongs to the owner on one side, and the other half to the owner of the other side; and, unless the wall has stood twenty years and upwards, each owner can do what he likes with his own half, and can pare it away if he likes. But in general, mutual interest prevents each party from resorting to his strict legal rights. A practice exists for one who builds a house adjoining the wall of a neighbor, to pay for half the expense. In Scotland, a party building close to the wall

of another's house can compel the owner of the first house to give him half of the wall or gable, on paying half the expense; while in England there is no such compulsion.

PASADENA, city and popular health resort in Los Angeles co., Cal.; on the southern California and the Los Angeles terminal railroad; 9 miles n.e. of Los Angeles, the co. seat. It is located at the foot of the Sierra Madre mountains, in the midst of magnificent scenery, in what has well been called the "Italy of America"—a land of perpetual sunshine and refreshing breezes direct from the ocean. There is nowhere a more agreeable climate or more equable temperature, the latter, as officially stated by the board of trade, having in the winter an average of 56°; spring, 61.07°; summer, 67.61°; and autumn, 62.31°—or only a difference of 11.61°. This locality is also conspicuous for the entire absence of marshes, and consequent malaria producing fevers and like disorders, while gout, rheumatism, liver and kidney troubles are alike known only among newcomers, and, as one writer remarks, "cannot be relied on to continue." Pasadena was first settled in 1874 by a colony from Indianapolis, and very soon became prominent for its horticultural enterprise. Such is the fertility of the soil that it would be difficult to name any fruit of the temperate, or semi-tropical zone, that cannot be produced in great profusion, though the citrus fruits are the most abundant. The streets of the city are lighted with gas and electricity, and there are several lines of street railroad. There are also newspapers, a public library, the Throop polytechnic institute, separate classical schools for boys and girls, high school, kindergartens, banks, several churches, and numerous hotels. During the winter months the population has been estimated at 12,000, while the permanent population, '90, was 4882.

PASARGA'DÆ, the ancient capital of Persia, before the foundation of Persepolis, apparently s.e. of that city, near the Carmanian border, on the Cyrus or Kores river in Coele-Persis. Its modern site is not known, but it is believed by Grotesend, Spiegel and others to be at a spot n.e. from Persepolis, where there is an ancient tomb on which is an inscription in three languages and a figure of Cyrus. The inscription is said to read, "I, Cyrus, king of the Achaemenidae." The ancient tribe called Pasargadae dwelt in the vicinity. From it is said to have sprung the royal family of the Achaemenidae.

PASCAGOU'LA, a river, and bay at its mouth, in Mississippi. The river, formed by the junction of the Leaf, the Chickasawha, with numerous branches, drains the southeastern portion of the state, and flows into Mississippi sound through two mouths which form the bay. It is navigable 100 m. through a sandy region of pine forests, supplying turpentine. The villages on the bay are summer resorts from Mobile and New Orleans; and on the shores at night are heard sounds like the Æolian harp, supposed to be caused by some kind of shell-fish.

PASCAGOULA, a town in Jackson co., Miss.; on Pascagoula bay and river and the Louisville and Nashville railroad; adjoining Scranton, the co. seat. It was incorporated as a village in 1890, and as a town in 1896, and has a convent, public and private schools, state bank, artesian well water, weekly newspaper, and a large shipping trade in lumber, fish, oysters, fruit, and vegetables. Pop. '90, not reported.

PASCAL, ADRIEN, 1815–1863; was a French military writer of some repute. He published several works, the more important being *The Military Life of Louis Philippe* (1841); *History of the Army from the Thirteenth Century to our Times* (4 vols., 1845–49); and *History of Napoleon III.* (1853).

PASCAL, BLAISE, one of the most distinguished philosophers and scholars of the 17th c., was b. at Clermont, in Auvergne, France, June 19, 1623. His father, Etienne Pascal, was president of the cour des aides at Clermont. His mother, Antoinette Bezon, died while he was little beyond infancy. He had two sisters—the elder, Gilberte, Madame Perier, afterwards his biographer; the younger, Jacqueline, who became a nun of Port Royal, under the celebrated Mère Angelique, sister of Antoine Arnauld. From childhood, Blaise gave evidence of extraordinary abilities; and when he reached his eighth year, his father resigned his office at Clermont, and came to Paris, In order personally to direct the boy's education. For the purpose of concentrating all the boy's efforts upon languages, his father kept out of his reach all books treating the subject of mathematics, for which he had early evinced a decided taste; and it is recorded that by his own unaided speculations, drawing the diagrams with charcoal upon the floor, he made some progress in geometry. One account represents him as having thus mastered the first thirty-two propositions of the first book of Euclid's *Elements*—a statement which carries its own refutation with it. Thenceforward he was allowed freely to follow the bent of his genuis. In his sixteenth year, he produced a treatise on conic sections, which extorted the almost incredulous admiration of Descartes. In his nineteenth year, he invented a calculating-machine; and turning his attention to the novel questions as to the nature of fluids, which Torricelli's theories had raised, he produced two essays, which, although not published till after his death, have established his reputation as an experimental physicist. His father having accepted an office at Rouen, Pascal was there brought much into intercourse with a distinguished preacher, Abbe Guillebert, a member of the Jansenists, but a man of great eloquence, a great master of ascetic theology, from whom and other members of the same rigid sect, as well as from the writings of

Arnauld, St. Cyran, and Nicole, Pascal's mind received a deeply religious turn; and his health having suffered much from excessive study, he gave himself up in great measure to retirement and theological reading, and to the practice of asceticism. The death of his father, and his sister Jacqueline's withdrawal to Port Royal, confirmed these habits; and it is to this period that we owe his magnificent though unfinished *Pensées*, which have extorted the admiration even of his unbelieving, and therefore unsympathizing, critics. Having fully identified himself with the Jansenist party, he was induced (1655) to take up his residence at Port Royal, although not as a member of the body, where he resided till his death, entirely given up to prayer and practices of mortification, among which practices may be mentioned that of wearing an iron girdle, studded with sharp points, which he forced into his flesh whenever he felt himself assailed by sinful thoughts. In the controversy to which the condemnation of Arnauld by the Sorbonne (1655) gave rise, Pascal took a lively interest; and it was to this controversy that he contributed the memorable *Lettres Provinciales*, published under the pseudonym of Louis de Montalt. These famous letters (eighteen in number, not reckoning the nineteenth, which is a fragment, and the twentieth, which is by Lamaistre), are written, as if to a provincial friend, on the absorbing controversial topic of the day. The first three are devoted to the vindication of Arnauld, and the demonstration of the identity of his doctrine with that of St. Augustine. But it was to the later letters that the collection owed both its contemporary popularity and its abiding fame. In these Pascal addresses himself to the casuistry and to the directorial system of Arnauld's great antagonists, the Jesuits; and, in a strain of humorous irony which has seldom been surpassed, he holds up to ridicule their imputed laxity of principle on the obligation of restitution, on simony, on probable opinions, on directing the intention, on equivocation and mental reservation, etc. In all this, he professes to produce the authorities of their own authors. Of the extraordinary ability displayed in these celebrated letters, no question can be entertained; but the Jesuits and their friends loudly complain of their unfairness, and represent them as in great part the work of a special pleader. The quotations with the exception of those from Escobar, were confessedly supplied by Pascal's friends. It is complained that many of the authors cited are not Jesuits at all; that many of the opinions ridiculed and reprobated as opinions of the Jesuit order, had been in reality formally repudiated and condemned in the society; that many of the extracts are garbled and distorted; that it treats as though they had been designed for the pulpit and as manuals for teaching, works which in reality were but meant as private directions of the judgment of the confessor; and that, in almost all cases, statements, facts, and circumstances are withheld, which would modify, if not entirely remove, their objectionable tendency. See Jesuits. To all which the enemies of the Jesuits reply by arguments intended thoroughly to vindicate Pascal. Pascal himself entertained no compunctious feeling for the production of these letters, but even at the approach of death declared his full satisfaction with the work, such as it was. His later years were made very wretched by continued, or at least frequently recurring hypochondria, under the influence of which he suffered from very painful fantasies, which he was unable to control. His strength was completely worn out by these and other infirmities, and, prematurely old, he died at the early age of 39, in Paris, in the year 1662. His *Pensées sur la Religion, et sur quelques autres Sujets*, being unfinished, were published with suppressions and modifications in 1669; but their full value was only learned from the complete edition which was published at the instance of M. Cousin (Paris, 1844). Of all his works, the *Lettres Provinciales* have been the most frequently reprinted. They were translated into Latin in the lifetime of Pascal by Nicole, under the pseudonym of a German professor, "Wilhelm Wendroc;" and an edition in four languages appeared at Cologne in 1684.

PASCHAL. See Passover.

PASCHAL I., b. Rome, 8th c.; d. 824; abbot of the monastery of St. Stephen at Rome, made cardinal by Leo III., and pope in 817. The donation of Louis the Pious was said to have been made to him. In 823 he crowned Lothaire, son of Louis, as emperor.

PASCHAL II. (Raniero of Bieda) Pope, b. in Tuscany, about the middle of the 11th c.; d. 1118. He was a monk of the order of Clugny, and, having been sent to Rome on the affairs of the monastery, he was made cardinal by Pope Gregory VII. He succeeded Urban II. as pope in 1099. He had a contest in regard to investitures with Henry V., king of the Germans, who went to Italy with an army in order to be crowned as emperor. Paschal proposed a compromise, but when Henry entered with the pope into the Vatican to be crowned the negotiation was broken off, and the pope refused to consecrate the emperor. Henry ordered his soldiers to seize the pope. A scuffle ensued; and the Roman people, enraged at the indignity put upon their pontiff, fell upon the German soldiers, killing some, and drove the rest back to their camp, outside the city. Henry stripped the pope of his pontifical ornaments, bound him with cords, and after keeping him prisoner for two months compelled him to issue a bull giving up the right of investiture to the emperor, and to consecrate him. Henry then returned to Germany. Paschal then summoned a council in the Lateran, which condemned the cession of the right of investiture, and pronounced the investiture of churchmen by lay hands a heresy. Henry again marched to Rome; the pope escaped to Benevento, and Henry caused him-

self to be crowned again by the bishop of Benevento. After Henry's departure Paschal returned to Rome, made preparations for war, but died before he could take the field. The question of the investiture was compromised in 1122 under Calixtus II., so that the bishops elected according to the canonical forms should receive their regalia from the emperor, and do homage for them, but that in the ceremony of investiture the emperor should use the scepter only, and not the ring and crosier, the emblems of spiritual authority.

PASCHAL CHRONICLE, so called because part of it was compiled from the Paschal canons (rules for the Easter festival) of various districts and towns, contains a summary of events in chronological order from Adam to 629 A.D., which was the 20th year of Heraclius. It was at one time named also *Alexandrinum,* because then attributed to a writer of Alexandria. The name of the author, however, is not known. It at first extended, according to the opinion of some, only to 354 A.D., in the reign of Constantius; the continuation of it with additions to the first part being the work of a later compiler. Others, however, regard it all as the work of one man. It is sometimes called also *Fasti Siculi,* because it had been found in an old library in Sicily, from which it was taken to Rome. Notwithstanding its numerous faults both of matter and style, it contains much valuable chronological information. An appended list of emperors from Augustus to Constantine Monomachus is evidently the work of a later author. A convenient edition, 2 vols., 8vo, was published by Dindorf at Bonn, 1832.

PASCO, a co. in western (peninsular) Fla., on the gulf of Mexico, formed 1887 from part of Hernando; 800 square miles; pop. '90, 4249. It is drained by several small rivers and contains much hilly land Products, cotton, oats, rice, corn, etc. Co. seat, Dade City.

PASCO, or CERRO DE PASCO, an important mining city in Peru, in the department of Junin, stands at an elevation of about 14,000 ft. above sea-level, 80 m. n.e. of Lima, in a direct line, but upwards of 130 m. by the winding mountain road. It consists of a collection of huts spread over an area that has been hollowed out and perforated in all directions by mines. The number of the inhabitants varies according to the state of the mines, being sometimes considerably more than 12,000, and often much less. It possesses a journal of literature and mining. The Cerro, or "mountain knot" of Pasco, rises in Sacshuanata, 16,000 ft. above the level of the sea. Coal is found.

PAS-DE-CALAIS (Fr. for strait of Dover), a department in the n. of France, bounded on the n. by the department of Nord and the strait of Dover, and on the w. by the strait of Dover and the English channel. Area, 2,551 sq. m. Pop. '91, 874,638. The surface is level, with the exception of a ridge of hills running from the s.e. to the n.w., ending in Gris-nez cape (q. v.), and forming the water-shed between the North sea and the English channel. The highest point (695 ft.) is reached a little to the s.w. of Desvres. The rivers, which are of no considerable length, are the Scarpe and Lys in the basin of the North sea, and the Authie and Canche belonging to the basin of the English channel. The rivers are navigable within the department, and are connected by canals. The coast-line is 80 m. in length, and the shores are in certain parts low and sandy; while for several miles on either side of Gris-nez, cliffs similar to those of Dover front the sea. The climate is mild, but exceedingly inconstant. The soil is very fertile—all the usual cereal and leguminous crops are produced in abundance—and the country is very productive both as regards agriculture and manufactures. Fishing is actively carried on on the coast, particularly in the neighborhood of Boulogne. Coal of an indifferent quality is raised, the excellent quarries of the department are worked, and considerable quantities of turf are cut. The industrial establishments are numerous and important, as iron-foundries, glass-works, potteries, tanneries, and numerous bleach-works, and mills and factories of various kinds. Boulogne and Calais are the principal harbors. There are six arrondissements—Arras, Béthune, St. Omer, St. Pol, Boulogne, and Montreuil. The capital is Arras.

PASENG. See GOAT.

PASHA', or PACHA, a title used in the Ottoman empire, and applied to governors of provinces, or military and naval commanders of high rank. The name is said to be derived from two Persian words—*pa,* foot or support, and *shah,* ruler—and signifies "the support of the ruler." The title was limited in the early period of the Ottoman empire to the princes of the blood, but was subsequently extended to the grand-vizier, the members of the divân, the seraskier, capitan-pasha, the begler-begs, and other civil and military authorities. The distinctive badge of a pasha is a horse's tail, waving from the end of a staff, crowned with a gilt ball; in war this badge is always carried before him when he goes abroad, and is at other times planted in front of his tent. The three grades of pashas are distinguished by the number of the horse-tails on their standards; those of the highest rank are pashas of three tails, and include, in general, the highest functionaries, civil and military. All pashas of this class have the title of vizier; and the grand-vizier is, *par excellence,* a pasha of three tails. The pashas of two tails are the governors of provinces, who generally are called by the simple title of "pasha." The lowest rank of pasha is the pasha of one tail; the sanjaks, or lowest class of provincial governors, are of this rank. The pasha of a province has authority over the military force, the revenue, and the administration of justice. His authority was formerly abso-

lute, but recently a check was imposed on him by the appointment of local councils. The pasha is in his own person the military leader and administrator of justice for the province under his charge, and holds office during the pleasure of the sultan—a most precarious tenure, as the sultan can at any moment, in the exercise of his despotic power, exile, imprison, or put him to death; and this has frequently been done in cases where the pasha's power has excited the apprehension, or his wealth the avarice of his royal master.

PASIPHAË. See MINOS.

PASKEVITCH, IVAN FEODOROVITCH, Count of Erivan, Prince of Warsaw, and a Russian field-marshal, was b. at Poltava, May 19, 1782. He was descended from a Polish family, and was at first a page to the czar Paul, but entered the army, and served in the campaign in 1805, which was ended by the defeat of Austerlitz; and then against the Turks. He took a prominent part in the campaign of 1812, and several times defeated the French under Eugène, Ney, and St. Cyr; he was also present at Leipsic and the conflicts under the walls of Paris. In 1825 he was appointed commander-in-chief against the Persians, whom he completely defeated, conquering Persian Armenia, taking Erivan, and ending the war by the peace of Turkmanshai (q.v.), a peace exceedingly favorable to Russia. In recompense for these services he was created count of Erivan, and received a grant of 1,000,000 rubles ($793,000). In 1828 and 1829 he made two campaigns against the Turks in Asia, signalized by the taking of Kars, Erzerum, and other important provinces, and terminated by the treaty of Adrianople in 1829. In 1831, Paskevitch, now a field-marshal, was appointed viceroy of Poland, put an end to the revolt within three months after his appointment, and reconstructed the administration on the basis of a complete incorporation with Russia. Such was the vigor and severity of his rule that the eventful year of 1848 passed over without any attempt at revolution. When Russian intervention in Hungary had been resolved upon, Paskevitch, though now 67 years of age, marched into that country at the head of 200,000 men, and, after a junction with the Austrians, defeated the Hungarians in several battles, and by mere force of numbers crushed out the last spark of insurrection. The 50th anniversary of his military service was celebrated at Warsaw, in 1850, with the utmost rejoicings, and on this occasion the sovereigns of Austria and Prussia conferred on him the rank of field-marshal in their respective armies. In 1854 he unwillingly took the command of the Russian army on the Danube; but fortune, which had hitherto invariably smiled upon him, deserted him at Silistria; and after undergoing a succession of sanguinary repulses, and being himself grievously wounded, he withdrew his army, and resigning the command retired to Warsaw, where he fell into a state of profound melancholy, and died Jan. 29, 1856.

PASMA is the name given to a non-officinal healing-powder, which is regarded as very serviceable in burns, ulcers, excoriations, etc. It is composed of 30 parts of silica, 12 of magnesia, 6 of alumina, 2 of protoxide of iron, and 50 of starch from the olgra root.

PAS'PALUM, a genus of grasses, with spikes either solitary or variously grouped, one-flowered spikelets, and awnless paleæ. The species are numerous, natives of warm climates.—*P. scrobiculatum* is cultivated as a cereal in India, where it is called koda. See MILLET. It will grow in very barren soils, and delights in a dry loose soil. *P. exile* is cultivated in like manner in the w. of Africa, where it is called fundi (q.v.) or fundungi.—Other species are valuable as fodder-grasses. *P. purpureum* is a very important fodder-grass in the coast districts of Peru during the dry months of February and March. *P. stoloniferum,* also a Peruvian species, has been introduced into France; but it is apt to be injured by frosts, and seldom ripens its seeds in the neighborhood of Paris.

PASQUE FLOWER, *Pulsatilla,* a genus of plants of the natural order *ranunculaceæ,* by many botanists still included in *anemone,* the chief distinguishing characteristic being the long feathery awns of the fruit. The species are perennial, silky, herbaceous plants, with doubly pinnatifid or doubly trifid leaves, and a simple one-flowered scape. They are narcotic, acrid, and poisonous. The common pasque flower (*pulsatilla vulgaris* or *anemone pulsatilla*) is a native of many parts of Europe, and of chalky pastures in several parts of England. It has widely bell-shaped bluish-purple flowers. Another species, *P.* or *A. pratensis,* a native of the continent of Europe, not of Britain, has smaller and more perfectly bell-shaped blackish-purple flowers.—These plants emit, when bruised, a pungent smell; and contain, as their principal constituent, a peculiar pungent essential oil, which, in combination with *anemonic acid,* forms an acrid and very inflammable substance called *anemonine,* or *pulsatilla camphor,* and is sometimes used in medicine. *Pulsatilla* is a favorite medicine of the homeopathists. *Easter eggs* are colored purple in some places by the petals of the pasque flower.—More acrid than any of the species just named is *pulsatilla potens,* which occasionally even blisters the skin.

PASQUIER, ÉTIENNE, 1529–1615; b. in Paris, of an esteemed family; educated for the bar, under the ablest jurists of France and Italy, and at the age of 20 received as an advocate in Paris courts. In 1560 he commenced the publication of his most important work, entitled *Récherches de la France,* and another, entitled *Pourparler du Princé.* The former has ever since been a classic authority. In 1564 he distinguished himself at the bar by a defense of the university of France against the claims of the Jesuits to establish

their authority within its circle; and by the lofty ground upon which he based the objection for the state itself rather than for the university, the masterly fullness of his arraignment of all the elements of dangerous political power that lay in the nature of their organization, his speeches became the first great arraignment of the order, then only 44 years from its origin. Immediately translated into all the continental languages, Pasquier's pleadings for a long time were the chief weapons of opposition to the growing power of that order. Henry III. made him advocate-general in 1585, deputy to the states-general at Blois in 1588, and member of a parliament of magistrates in 1589. The eight volumes of the *Récherches*, etc., above mentioned, treat, 1st, of the establishment of the French—the origin of the nation; 2d, of magistrates, parliaments, states-general; 3d, of ecclesiastical affairs, the power of the popes, and the liberty af the Gallican church; 4th, of judgments, procedures, and customs; 5th, various historical questions; 6th, celebrated trials; 7th, of the origin of French poetry and of the language; 8th, of the French language, 9th, of French literature, the university, and its studies. Selections from his works, entitled *Œuvres Choisies*, were published by M. Feugère, Paris, 1840. The letters of Pasquier, published in 1586, and again in 1619 in 4 vols. quarto, originally appeared in 22 vols. They form a picturesque panorama of the life and thought of the times in which he lived; sketches of history and law, of biography, of manners and customs, all given with a liveliness and warmth of style equal to the models of similar writings with which later French literature abounds.

PASQUIER, Étienne Denis, Duc de, 1767–1862; a descendant of the great jurist author Étienne; born, educated, and died in Paris. He was early in government employ; in 1806 attracted the favor of Napoleon, and not long after became *procureur-general* of the seals, and of titles, and then prefect of police; director of roads and bridges under Louis XVIII., and minister of the interior; minister of justice in 1817; of foreign affairs in 1819. In 1820 he became conspicuous for his advocacy of absolutism, and used the expression, become famous, that "despotism specifically expressed becomes a salutary remedy in great perils." After 1821 he sat in the chamber of peers; in 1830 gave adhesion to Louis Philippe; was made chancellor, and in 1844 duke. In 1842 he became a member of the French academy by the same courtier-skill which made his road smooth to royal favor through four different reigns, which favor he seems to have partly merited by a wise business administration.

PASQUINADE, an anonymous or pseudonymous publication of small size, sometimes printed, sometimes only posted up or circulated in manuscript, and having for its object the defamation of a character, or at least the turning of a person to ridicule. The name is derived from *Pasquino*, a tailor remarkable for his wit and sarcastic humor, who lived in Rome towards the close of the 15th c., and attracted many to his shop by his sharp and lively sayings. Some time after his death, a mutilated fragment of an ancient statue, considered to represent Menelaus supporting the dead body of Patroclus, was dug up opposite his shop, and placed at the end of the Braschi palace, near the piazza Navoni. It was named after the defunct tailor, and thus the practice originated of affixing to it placards containing satires and jests relative to the affairs of the day—the pope and the cardinals being favorite victims of the invisible satirists. It till recently continued to be the only outlet which the Roman had for his opinions and feelings. One or two may be quoted as specimens of the mordant style of the Pasquin statue. "Great sums," said the satirist one day, in an epigram addressed to Pope Paul III., "were formerly given to poets for singing; how much will you give me, O Paul, to be silent?" On the marriage of a young Roman called Cesare to a girl called Roma, the statue gave the following advice: "Cave, Cæsar, ne tua Roma respublica fiat." Next day the rival statue of Marforio, in the capitol, replied: "Cæsar imperat;" to which Pasquin, with exquisite malice, retorted: "Ergo coronabitur."

PAS'QUOTANK, a co. in n.e. North Carolina, having the Pasquotank river for its e. boundary, flowing into a bay of the same name, and Albemarle sound on the s.e.; bounded on the w. by Little river, an outlet like the Pasquotank, of a lake in the n. section; 200 sq.m.; pop. '90, 10,748, chiefly of American birth. It is intersected by the Dismal Swamp canal; connecting its co. seat with Norfolk through the Pasquotank river. Its surface is low and swampy, the Dismal swamp extending into its n. portion. Its soil is very fertile along the water courses, and produces grain, cotton, sweet-potatoes, and pork. Its leading industries are the manufacture of lumber and coaches. Co. seat, Elizabeth City.

PASSAGE, West, a sea-port town upon the western shore of the estuary of the river Lee, in the county of Cork, Ireland, which has risen into importance chiefly as a watering-place, and as the shipping-port and marine suburb of the city of Cork, from which it is distant, by the Cork and Passage railway, about 6 miles. As the river above Passage is not navigable for ships above 400 or 500 tons burden, ships of higher tonnage discharge their cargoes at Passage. It is also a ship-building station. Pop. 2,389, about four-fifths of whom are Catholics. The rest belong mainly to the Protestant Episcopal church, other denominations being sparsely represented.—There is another small town of the same name, East Passage, near the mouth of the Suir, in the county of Waterford, Ireland.

PASSAGLIA, CARLO, a Roman Catholic theologian of great eminence, who has obtained much notoriety in connection with the recent movement for the unity of Italy, is a native of the duchy of Lucca, where he was born May 2, 1812. His origin is very humble, and he entered extremely young as a scholar of the Jesuit society, of which he was enrolled a member in the year 1827. Having obtained much distinction in the schools of the order, and having, as is usual with its members, taught for some time in the lower schools, he completed his theological studies in the Roman college, and was appointed professor of canon law, and eventually of dogmatical theology. His reputation for learning stood in the very first rank of Roman Catholic theology, and his lectures were exceedingly admired for their eloquence and erudition, but were considered in some respects too diffuse for the class of pupils who frequented his school. During the temporary withdrawal of the Jesuits from Rome in 1848–51, Passaglia, with some of his brethren, came to England, where he taught theology to the young brethren of his order, and on the re-establishment of the Jesuits in the Roman college, he resumed possession of his chair. During the discussions which preceded the definition of the doctrine of the immaculate conception of the Virgin Mary (see MARY), Passaglia published an elaborate treatise on the doctrine and history of that question, which was published at the cost of the Roman government. Soon afterwards, however, the dissatisfaction which was expressed at the unsuitable character and method of his lectures by the authorities of the order led to his resignation of the professorship of theology. Still, however, he continued a member of the society; and the pope, who felt a warm friendship for him, established in the Roman university a special chair of philosophy for him, which he did not long retain. In 1858 or 1859 he left the society of the Jesuits, and entered warmly into the discussions as to the temporal power of the pope, in connection with which he undertook a voluntary mission to Turin, which, however, led to no results. Having fallen under suspicion in Rome, and his house having been invaded by a domiciliary visit of the police, he withdrew from that city to Turin, where he established a journal entitled *Il Mediatore,* which appeared till 1866. He was appointed by the king professor of moral philosophy, and subsequently of theology in the university of Turin. In 1863 he became a member of the Turin parliament, but his success fell far short of his reputation. He is said to have sought reconciliation with the church, but to have failed to make the required retraction. He died in 1887.

Passaglia's principal works are the treatise on the immaculate conception already referred to (4 vols. 4to); a treatise (Latin) on the primacy of St. Peter (8vo, 1850); a scholastic treatise entitled *Commentarius Theologicus de Partitione Divinæ Voluntatis* (8vo, Rome, 1851); an apology for the cause of Italian unity, entitled *Pro Causa Italica; ad Episcopos Catholicos* (Florence, 1861), in which he recommends the church to make peace with the nation; several essays on religious and political subjects, and recently a learned and very detailed reply to Renan's *Vie de Jésus* (Italian).

PASSA'IC, a river of New Jersey, rises in Morris co., and after a circuitous south-easterly course of 100 m., empties into Newark bay. It is navigable for steamboats and sloops for about 15 miles; and its falls of 72 ft. at Paterson furnish water-power to numerous factories, and are an attraction to tourists.

PASSA'IC, a co. in n. New Jersey, bordering on New York; drained by the Passaic, Pequannock, Ringwood, and Ramapo rivers; intersected by the Delaware, Lackawanna, and Western railroad, by the main and branch lines of the New York, Lake Erie, and Western, and by the Morris canal; 197 sq. m.; pop. '90, 105,046, chiefly of American birth. The soil is fairly fertile, and there are extensive manufactures of silk goods and sewing silk, and of machinery and iron-ware. Co. seat, Paterson.

PASSAIC, a city in Passaic co., N. J., on the Passaic river, and the Erie, the Delaware, Lackawanna and Western, and the New York, Susquehanna, and Western railroads; 11 m. n.w. of New York. It has electric lights, electric street railroads connecting with Newark, Paterson, and Hoboken, high school, public library, emergency hospital, waterworks, national and state banks, over 20 churches, fine city hall, rubber and woolen mills, print works, large vineyard and winery, and daily and weekly newspapers. Pop. '90, 13,028.

PASSAMAQUOD'DY BAY opens into the Atlantic ocean through the bay of Fundy, between Maine and New Brunswick. It is 12 m. long by 6 wide, and shut in by a cluster of islands so as to form an excellent harbor. It receives the St. Croix, Didgequash, and other rivers, and forms the harbor of the flourishing city of Eastport.

PASSANT, a heraldic term used to express the attitude of an animal in a walking position, with his head straight before him.

PASSA'ROWITZ, or POSHAREWATZ (Servian, *Pozarevaz*), a t. in the principality of Servia, 5 m. s. of the Danube. Its streets are wide and unpaved, its houses detached, and surrounded with palisades. Pop. '90, 11,134. The town is chiefly noteworthy for the treaty which was signed here by Prince Eugene and the grand vizier, July 21, 1718.

PASSAU, an ancient and picturesque city of Bavaria, at the confluence of the Inn and the Ilz with the Danube, 72 m. s. e. of Ratisbon. It consists of Passau proper (triangular in shape, and occupying an eminence on the tongue of land between the right bank of the Danube and the left bank of the Inn), and the suburbs, Innstadt, on the right bank of the Inn; Anger and fort Oberhaus, between the Danube and the

Ilz; and Ilzstadt, on the left bank of the Ilz. At the point of junction, the Inn is both wider and has had a longer course than the Danube, the former being 834 ft.; while the latter is only 696 ft. wide. The railway bridge and another iron bridge on eight piers of granite, connect Innstadt with Passau, and the Danube is crossed by a fine bridge resting on seven piers, also of granite. Fort Oberhaus, on the left bank of the Danube, stands on steep, wooded cliffs, at an elevation of upwards of 400 ft., and is connected with the castle of Niederhaus by old walls; both are now used as prisons for criminals from the upper classes and military offenders. The appearance of Passau, situated at the confluence of two great rivers, and rising like an amphitheater on the most beautiful spot of the Danube, is strikingly effective and picturesque. Among the chief buildings are the cathedral, the bishop's palace, the post-office, where the treaty of Passau was signed in 1552; the Jesuits' college, a large building now used as a school; and the church of St. Michael's. In the cathedral square (Domplatz) is a bronze statue of king Maximilian Joseph, erected in 1828. Passau contains also numerous picture galleries, collections of antiquities, and benevolent and charitable institutions. The women of Passau are famous for their beauty. Pop. '90, 16,633.

The natural advantages of this site, in a military point of view, were appreciated at an early period by the Romans, who erected a strong camp here, garrisoned it with Batavian troops, and from this circumstance named it *Batava Castra*. Passau was long the seat of an independent bishopric founded in the 7th c., but secularized in 1803.

PASSAVANT, Johann David, 1787–1861; b. Frankfort-on-the-Main; painter and art critic, studied in Rome and Paris, eventually became inspector of the Städel museum at Frankfort. He published, 1839–58, *Rafael von Urbino und sein Vater Giovanni Santi*, 3 vols.; in 1853, *Die Christliche Kunst in Spanien;* and, 1860–64, *Le Peintre-Graveur*, 6 vols., a history of engraving highly esteemed.

PASSAVANT, William Alfred, d.d. (1824–94), philanthropist, is well known as the founder of hospitals and orphan asylums, at various places in the United States. In 1870 he assisted A. Louis Thiel in founding Thiel college at Greenville, Pa. He introduced the order of deaconesses into the U. S., and was founder and editor of the Pittsburgh *Workman* and editor of *The Missionary* and *The Lutheran.*

PASSECAILLE and PASSEPIED, two old French dances, the music of the former being in $\frac{3}{4}$, the latter in $\frac{6}{8}$ time. Compositions under these names, suggestive of the dances in question, though not meant for dancing, occur among the "suites," or collections of short pieces for the harpsichord or clavichord by Sebastian Bach, and Handel.

PASSEMENTERIE is a French term applied at present to all gold or silver lace, or to trimmings made of gimps, cords, or ornamental patterns in jet. Early in the seventeenth century the French called all lace *passement*, and the lace trade was entirely in the hands of the "passementiers" of Paris, hence all fancy trimmings came to be called passementerie.

PASSENGER PIGEON, *Ectopistes migratoria,* a species of pigeon, native of North America, and particularly interesting from the marvelous numbers of which its flocks are often composed. The genus to which it belongs has, like the turtle doves, a bill more slender than the ordinary pigeons, notched, and with a tumid fleshy covering above at the base; the head is small in proportion to the body, the legs are short and strong, the feet naked, the tail either rounded or wedge-shaped, the wings long and pointed. The passenger pigeon, generally known in North America as the wild pigeon, has a long wedge-shaped tail; the whole length being from 15 to 17 in., of which the tail occupies nearly one half. It is a beautiful bird, of very graceful form and finely colored plumage. The plumage of the female is duller than that of the male.—The passenger pigeon is found in almost all parts of North America, from the gulf of Mexico to the Arctic regions. It is not, properly speaking, a bird of passage; its migrations being apparently altogether consequent on the failure of the supplies of food in one locality, and the necessity of seeking it in another, and not connected with the breeding season or the season of the year. Its power of flight is very great, and it is supposed to be able to sustain a long flight at the rate of 60 m. an hour. Passenger pigeons have been killed in the neighborhood of New York, with their crops full of rice, which they must have collected in the fields of Carolina or Georgia not many hours before. The nest of the passenger pigeon in the American forests generally consists of a few dry twigs placed in a fork of the branches of a tree, and containing two eggs, sometimes only one egg. They breed two or three times in a season. In the backwoods, vast numbers of pigeons build in one breeding-place; many nests, sometimes 100 or more, are often to be seen in one tree. These great breeding-places extend over a tract of forest, sometimes not less than 40 m. in length; but in the more cultivated parts of the United States the passenger pigeon builds singly and not in communities. Flocks of them are to be seen flying at a great height in dense columns, 8 or 10 m. long; and there is reason to suppose, from the rapidity of their flight, and the number of hours taken by a column in passing a particular spot, that in some of their great migrations the column, a mile broad, is more than 150 m. long. Perhaps nothing is so wonderful in relation to any species of bird as the size of their roosting-places. The noise of wings and of cooing voices is as loud as thunder, and is heard at the distance of miles. It drowns the report of guns. The multitudes which settle on trees, break down great branches by their weight, so that it is dangerous to pass beneath. They crowd together, alighting one upon another, till

they form solid masses like hogsheads, and great numbers are killed when the branches break. The inhabitants of the neighboring country assemble, shoot them, knock them down with poles, stifle them by means of pots of burning sulphur, cut down trees in order to bring them in great numbers to the ground, eat them, salt them, and bring their hogs to fatten on them. Wolves, foxes, lynxes, cougars, bears, raccoons, opossums, polecats, eagles, hawks, and vultures all congregate to share the spoil. The flesh of the passenger pigeon is of a dark color, but tolerably pleasant. That of young birds is much esteemed. The nestlings are in general extremely fat, and are sometimes melted down for the sake of their fat alone. The food of the passenger pigeon consists chiefly of beech-mast and acorns, but it readily eats almost any kind of nut, berry, or seed.

PASSENGERS BY LAND AND SEA. The common law affecting passengers by land, in a carriage or public conveyance, is concisely as follows: The owners of the railway or other carriage do not contract to carry the passenger with perfect safety; they do not warrant that he will not be injured; but they merely contract to carry him without any negligence on their part.

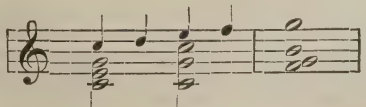
In the case of passengers by sea, a peculiar code has been constructed, owing to the peculiarity of their situation. The fundamental rule of the common law is the same as on land carriage—that the carrier by sea does not engage to carry with absolute safety, but merely to omit nothing in his power, and to use due care. The legislature, however, has passed statutes to regulate the duties of carriers by sea, so as to secure due care; and their minute and detailed regulations apply to every sea-going vessel, whether native or foreign, carrying more than 50 passengers. Payment of the passage money must be made before commencing the voyage, and the owners are not bound to forward steerage passengers by the very ship contracted for, if an equally eligible ship be offered, provided, however, that families are not to be separated. If the ship is disabled on the voyage, the owners are bound to repair the ship in six weeks, or send on the passengers. If the passengers exceed 300, a medical practitioner must be on board, and the provisions must be according to a certain scale of diet. The emigration commissioners require to inspect emigrant ships, and to give a certificate as to fitness.

In the United States, as in England, common carriers of passengers are bound to use the greatest possible care in fulfilling their contracts for the transportation of their patrons; but there is a difference between the states as to the question of the effect of contributory negligence on the part of the passenger. In many states, as in England, the burden of proof is upon the carrier to show that the negligence of the passenger contributed to the injury; but in others (as N. Y.) the passenger must establish affirmatively that he was not guilty of negligence, or else he cannot recover. There has been much discussion as to the relative merits of these conflicting rules; and while it must be confessed that the English rule has a wholesome influence upon railroad companies and other carriers, it must also be admitted that it often opens the door to fraud, and causes the companies to be unjustly mulcted in damages. All states agree that where the passenger is clearly negligent he cannot recover damages; but there are distinctions in some of the western states as to the degrees of negligence which are not generally recognized. Carriers are particularly liable for any acts of ill treatment which a passenger may suffer at the hands of their employés. And the relation of carrier and passenger can be created by a *bona fide* intention on the part of the passenger. In general the carrier must accept all who apply to be carried; but drunkenness, refusal to pay fare, the fact that there is no room in the conveyance, the fact that the person applying is afflicted with a contagious disease, or that the person is a fugitive from justice—all have been held sufficient to excuse a carrier from receiving the person for transportation. The carrier may, however, make reasonable regulations for the proper conduct of his business; and for this reason a regulation that colored persons should ride in a particular car may not be unlawful, if the accommodations so provided are equally agreeable with those allotted to the white passenger. Full provisions for the health and safety of passengers at sea have been made by the U. S. law.

PASSERINE BIRDS. See INSESSORES.

PASSING-BELL, a bell tolled during the death agony of a dying person, at the moment of the soul's "passing" from earth to its eternal abode. Its use in Catholic countries is to invite the hearers to join in the prayers which are ordered "for the dying in their hour of agony," and which the priest with his attendants recite in the death chamber. See BELL.

PASSING NOTES, in music. In passing from one chord to another, an intervening note, not belonging to either chord, may be used to assist the progression. Such a note is called a passing note or note of transition, as the notes D and F in the upper part of the subjoined example:



PASSION CROSS, a cross of the form on which our Savior suffered, with a long stem and a short traverse near the top. It is of occasional occurrence as a heraldic charge,

though less frequent than many other varieties of cross. A passion cross, when elevated on three steps or degrees (which have been said by heralds to represent the virtues of faith, hope, and charity), is called a cross Calvary.

PASSION-FLOWER, *Passiflora,* a genus of plants almost exclusively natives of the warm parts of America, and belonging to the natural order *passifloraceæ;* an order of exogenous plants, of which more than 200 species are known, mostly climbers, having tendrils which spring from the axils of the leaves, herbaceous or half shrubby, natives of tropical and subtropical countries, but rare in Asia and Africa. The leaves of the *passifloraceæ* are alternate, simple, and variously lobed. The flowers are generally hermaphrodite, with a colored calyx, generally of five segments; the segments of the corolla equal in number to those of the calyx or absent, and several rows of filamentous processes springing from within the cup which is formed by the consolidated calyx and corolla; the stamens, generally five, and generally united by their filaments, inserted at the base of the tube of the calyx; the ovary free, generally elevated on a long stalk, one-celled; three thick styles with dilated stigmas; ovules numerous. The fruit is either fleshy or capsular. In the passion-flowers it is fleshy. This genus has received its name from fanciful persons among the first Spanish settlers in America, imagining that they saw in its flowers a representation of our Lord's passion; the filamentous processes being taken to represent the crown of thorns, the nail-shaped styles the nails of the cross, and the five anthers the marks of the wounds. The species are mostly half shrubby evergreen climbers, of rapid growth; and most of them have lobed leaves, with from two to seven lobes. The flowers of many are large and beautiful, on which account they are often cultivated in hot-houses. Some of the species are also cultivated in tropical countries for their fruit, particularly those of which the fruit is known by the name granadilla (q.v.). The fruit of *P. edulis* is also somewhat acid and of a pleasant flavor, and ices flavored with it are delicious. Its fruit is about two inches long, and an inch and a half in diameter, of a livid purple color, with orange pulp.

PASSIONISTS, a religious congregation of priests of the Roman Catholic church, the object of whose institute, indicated by their name, is to preach "Jesus Christ and him crucified." The founder, Paul Francis, surnamed Paul of the cross, was born in 1694 at Ovada, in the diocese of Acqui in the kingdom of Sardinia. Having commenced his career as a hermit, he formed the design of enlisting others in the missionary life; and being ordained priest in 1737, he associated himself with ten others, and obtained for his plan the approbation of successive popes, together with the convent on the Celian hill at Rome, which still forms the mother-house of the congregation. The special object of the institute was to instill into men's minds by preaching, by example, and by devotional practices, a sense of the mercy and love of God as manifested in the passion of Christ. Hence the cross appears everywhere as their emblem, in their churches, in their halls, and in the courts and public places of their monasteries. A large crucifix, moreover, forms part of their very striking costume. They go barefooted, and practice many other personal austerities, rising at midnight to recite the canonical hours in the church; and their ministerial work consists chiefly in holding what are called "missions" wherever they are invited by the local clergy, in which sermons on the passion of Christ, on sin, and on repentance, together with the hearing of confessions, hold the principal places. Paul of the cross died in 1775.

PASSION MUSIC, music composed to celebrate the Passion during Holy Week. The earliest known Passion is a solemn plain chant melody which was handed down by tradition. A version of this was published by command of Pope Sixtus V. by Giudetti (Rome, 1586). S. Gregory Nazianzen (330–390) was the first to arrange the history of the Passion in a dramatic form. From the beginning of the 13th century until the 16th, the Passion was sung by three deacons, but in 1585 Vittoria made a polyphonic setting of the words formerly spoken by the congregation, and these were found effective and continued in use. This was published by Gardano (Rome, 1585). Francesco Suriano also made a polyphonic setting for four voices (contained in Broske's *Musica Divina,* vol. IV.). The old church form of the Passion contained a dramatic germ, which developed into the mystery and miracle plays originally performed in the churches, and valuable specimens of the music to them is extant. In Germany, passion music reached its climax with Bach, and was developed through these old forms, and through the influence of the Italian oratorio, into a new type both simple and intricate. The greatest example of Passion music is that after Matthew, set by John Sebastian Bach, and first performed at St. Thomas's Church, Leipsic, in April, 1729. The music is written for two choruses, each with its separate orchestral and organ accompaniment. It also contains many beautiful and ancient German chorales. Bach also wrote other settings of the Passion—St. John, 1724; St. Mark, 1731; St. Luke, 1733; and one that is lost. Other Passion music was composed by Obrecht, 1538; Orlando di Lasso, 1575; Bartholomäns Gese, 1588; Vulpius, 1613; Heinrich Schütz, 1645; Sebastiani, 1672; Remhard Keiser, 1704; Telemann, 1716; Graun, 1756; and many others. See Winterfeld, *Der Evangeliche Kirchengesang,* III.; Bitter, *Geschichte des Oratoriums;* Spitta, *Bach* (Bell's translation, II.); Monat, *Shelfte für Musikgeschichte,* III.; and *Vierteljahreschrift für Musikwissenschaft* (1888).

PASSION PLAY. See MYSTERIES.

PASSION-WEEK, the name commonly given in England to the week immediately preceding Easter, and otherwise called holy week (q.v.). But by the proper rubrical usage, passion-week is that which precedes holy week, commencing on PASSION SUNDAY, the fifth Sunday of Lent.

PASSOM'ETER, a watch-shaped instrument carried about the person to register the steps taken in walking. It consists of a dial and two hands, which are moved by a ratchet worked by a weight which the motion of walking causes to vibrate.

PASSOVER, *Pesach, pascha,* the first and greatest of the three annual feasts (*regalim*) instituted by Moses, at which it was incumbent upon every male Israelite to make a pilgrimage to the house of the Lord. It was celebrated on the anniversary of the exodus from Egypt—i.e., on the 14th day of Nisan, otherwise called Abib, the period of the first full moon in the spring—and lasted eight days. In commemoration of the incidents connected with the great event of the liberation of the people, it was ordained that unleavened bread only should be eaten during this festive period, whence it also bore the name *chag hamazzoth* (feast of unleavened bread); and, further, that a lamb one year old, and free from all blemish, roasted whole, together with bitter herbs, should form the meal in every house on the eve of the feast. Prayers and thanksgivings, all with a reference to the redemption from bondage, accompanied the repast, at which the members of the family or families who had joined in the purchase of the lamb had to appear in traveling garb. At a later period, a certain number of cups of red wine were superadded to this meal, to which, as its special ceremonies and the order of its benedictions were fixed, the name *seder* (arrangement) was given. The name passover was more strictly limited to the first day in which the paschal lamb was entirely consumed, the reserving of any part of it to the next day being expressly forbidden (Ex. xii. 10); and the name feast of unleavened bread belonged rather to the remaining days.

The passover is generally regarded by Christian theologians as at once a sacrifice and a sacrament, and in the former character as an eminent type of the sacrifice of Christ. The death of Christ at the very time of the passover is regarded as corroborative of this view, which is indeed plainly adopted in certain passages of the New Testament, as John xix. 36, and 1 Cor. v. 7, in which last place our Saviour is designated "Christ our Passover." The passover is regarded as typical of Christ, in its connection with the deliverance of Israel from the bondage of Egypt, held to typify our salvation from the bondage of sin; in its being a sacrifice, and that of a lamb without blemish—the perfection of the paschal lamb, as of the other sacrificial victims, being supposed to signify the perfection of the great sacrifice; and in many other minor particulars, of which one is that referred to in John xix. 36, that no bone of the paschal lamb was to be broken.

The paschal meal, as at present celebrated among the Jews, has more the character of a hallowed family feast, with reference, however, to the great national event. The greater part of those, it may be added here, who live out of the Holy Land celebrate it on the two first evenings, as owing to the uncertainty prevalent at one time with respect to the fixing of the new moon by the sanhedrim at Jerusalem, it was ordained that the "exiles" should celebrate all their festivals—except the day of atonement—on two successive days, a law still in force among the orthodox. The regulations of the "lamb for each house," the traveling garb, etc., are abrogated, but many further symbolical tokens have been superadded; reminiscences, as it were, both of the liberation from Egypt and the subsequent downfall of the sanctuary and empire. The order of prayers and songs to be recited on these evenings has also received many additions, and even mediæval German songs have crept in, as supposed to contain a symbolical reference to the ultimate fate of Israel. See HAGGADA (*shel pesach*), FESTIVALS, EASTER, LORD'S SUPPER.

PASSOW, FRANZ LUDWIG KARL FRIEDRICH, 1786–1833; b. Germany; educated at Leipsic, where he studied philology and theology. He was called in 1807 to the chair of Greek in the Weimar gymnasium, and in 1815 to that of ancient literature in the university of Breslau. His principal work is his *Dictionary of the Greek Language,* 1831, which formed the basis of Liddell's and Scott's *Lexicon.*

PASSPORT, a warrant of protection and permission to travel, granted by the proper authority, to persons moving from place to place. Every independent state has the right to exclude whom it pleases from its territory, and may require that all strangers entering it be furnished with properly authenticated documents, showing who they are, and for what purpose they are visiting the country. Passports are sometimes issued by the ministers and consuls of the country which the traveler intends to visit, which cannot, however, be done without the consent or connivance of the state of which the holder of the instrument is a subject; they properly proceed from the authorities of the state to which the traveler belongs, and ought to bear the *visa* or countersignature of the minister or consul of the country which he is about to visit. In some European states no one is allowed to go abroad without a passport from his government authorizing him to leave the country—a provision used as a means of detaining persons charged with crime; and passports are even required by the natives to enable them to go from place to place in their own country. The regulations of different states have varied much regarding the use of passports; and of late years there has been a great relaxation of the stringency of the regulations connected with them. Since the facilities of traveling have so greatly increased, it seems to have become the prevalent opinion that the passport system tends to obstruct the free intercourse that is desirable between citizens of different countries;

while it is ineffectual to prevent the entrance of dangerous or suspicious characters, who can obtain passports on false pretenses, or make their way in without them. Within the United Kingdom no passports are required; but for a British subject traveling in some parts of the continent they are still requisite. At one time the greater part of British subjects traveling abroad used to be furnished with passports from the ministers or consuls of the countries which they purposed to visit; the lord provost of Edinburgh was also in the way of issuing passports to Scotchmen. Of late years the passport most used by British subjects is that of the British secretary of state for foreign affairs, which is now granted to any British subject for a fee of two shillings, and is good for life. If the applicant be not personally known to the secretary of state, he must either be recommended to him by some person who is known to him, or produce an application in his favor by some banking firm established in London or elsewhere in the United Kingdom, or a certificate of identity signed by a mayor, magistrate, justice of the peace, minister of religion, physician, surgeon, solicitor, or notary, resident in the United Kingdom. In certain cases the production of a certificate of birth may be required. If the applicant be a naturalized British subject, his certificate of naturalization must be forwarded to the foreign office. If it be dated subsequently to Aug. 24, 1850, and previously to Aug. 1, 1858, his passport will be good for one year only; if subsequently to Aug. 1, 1858, for six months only. The passport of a British subject naturalized by act of parliament is good for life. Where the passport system is in full force, it is required that the passport be countersigned by the minister or consul of the country which the holder means to visit, the visa being only of force for a year. The French government allows British subjects to enter and leave France, and travel in it without passports; but they are said to be sometimes asked for when France is entered from the south and east. In Belgium, Holland, Germany, Switzerland, Austria, Italy, Denmark, Norway, and Sweden, passports are no longer required. For Greece and Portugal they are necessary, and the visa is insisted on in Russia, Turkey, and Egypt. A British subject traveling in countries where passports are not *de rigueur*, will sometimes find it an advantage to have one as an evidence of his identity and nationality. Till lately, throughout the greater part of Europe, a traveler was liable to be called on to produce his passport, not only at every frontier town, but at every garrison town through which he passed. In several of the countries where passports are not required of travelers they are of a decided advantage, if not a necessity, to those who propose to settle there for some time—for example in Germany, especially since the anti-socialist legislation.

In time of war, passports or safe-conducts are granted by the supreme authority on the spot—i.e., the officer in command—to insure safety to the holders when passing from spot to spot, or while occupied in the performance of some act specified in and permitted by the passport. Passports may be granted for goods as well as individuals; and, in time of war, the passport of a ship is the formal voucher of its neutral character. It purports to be a requisition on the part of the government of a state to allow the vessel to pass freely with her company, passengers, goods, and merchandise, without hindrance, seizure, or molestation, as being owned by citizens or subjects of such state.

PASSY, a t. of France, in the department of Seine, a suburb of Paris, and included within the fortifications of that city. See PARIS.

PASTA, GIUDITTA (JUDITH), one of the most distinguished opera singers of modern times, was b. near Milan in Italy in 1798, and received her musical education partly at Como, under the chapel-master of the cathedral there, and partly in the conservatoire at Milan. After 1811 she appeared at various theaters of the second rank in northern Italy, and obtained a respectable success, but did not give any particular indication of possessing more than average ability. Her first great triumph was achieved at Verona in 1822. The year following she was engaged at the Paris Italian opera, where her singing excited great admiration. From this moment she labored incessantly to reach the ideal perfection she had set before her mind. From 1825 to 1830 was the period of her most splendid triumphs, which were won principally in London and Paris. Vienna, where she accepted an engagement in 1832, witnessed the last. Some time afterwards she withdrew from the stage and purchased a villa on the banks of lake Como, where, and at Milan, she resided till she died in 1865. Pasta in her best days had a magnificent voice, which easily passed from clear shrill soprano notes to the gravest contralto tones. In addition she had a fine dramatic energy and stateliness of manner that suited lofty and imposing characters. Her principal rôles were *Medea*, *Desdemona*, *Semiramide*, *La Sonnambula* and *Norma* (these operas were written for her by Bellini) and *Giulia* in *Romeo e Giulia*.

PASTE, a term applied to various compositions in which there is just sufficient moisture to soften without liquifying the mass.

Common or adhesive paste is made by mixing wheaten flour with cold water in the proportion of about two pounds to a gallon. The water is added by degrees, and well stirred in so as to prevent lumpiness. About an ounce of powdered alum is sometimes added to increase its adhesiveness, and for shoe-makers and book-binders about an ounce and a half of finely-powdered rosin is substituted for the alum, which thickens it much and renders it much more tenacious. When the ingredients are thoroughly mixed, they are boiled, great care being taken to stir them thoroughly whilst boiling to prevent burn-

ing. This paste is used for a great variety of purposes, more especially by paper-hangers, bill-stickers, book-binders, pasteboard makers, etc. An adhesive paste, called *Chinese paste*, is made by reducing to perfect dryness bullock's blood. It is then powdered and mixed with one-tenth of its weight of finely-powdered quicklime. When used, it is mixed with water sufficient to form a paste, which is a strong cement for pottery, wood, stone, etc. For other applications of the word paste, see GEMS (IMITATION), and MACARONI.

PASTEBOARD. See PAPER.

PASTEL, chalk mixed with other materials and various colors, and formed into pencils or crayons (q.v.).

PASTEL. See WOAD.

PASTEUR, LOUIS, b. Dôle, France, 1822; made a special study of chemistry, took his degree 1847; appointed professor of physical sciences at Dijon 1848; professor of chemistry at Strasbourg 1849; organized the new faculty of science at Lille 1854. In 1856 he received the Rumford medal of the royal society of London. In 1857 he went to Paris as scientific director of the normal school, and was elected member of the institute. In 1863 he became professor of geology, physical science, and chemistry at the school of fine arts, and was at one time professor of chemistry at the Sorbonne. In 1873 he was elected an associate member of the academy of medicines. He was granted a pension by the French government, in 1874, of 20,000 francs. He contributed several essays to *Annales de Chimie;* in 1863 published *Nouvel Exemple de Fermentation;* 1866, *Etudes sur le Vin;* 1868, *Etudes sur le Vinaigre;* 1870, *Etudes sur la Maladie des Vers de Soie.* His opposition to Pouchet on the subject of spontaneous generation awakened much interest, 1862–65. In molecular chemistry Pasteur achieved important results; and in the province of fermentation and the germ theory (q.v.) his works are of special value. His studies on the diseased conditions of wine and beer have rendered possible the prevention of these conditions. His investigations into the silk-worm's disease, *pebrine,* and its cure, have proved of signal service. His discovery of bacteria as the cause of anthrax (splenic fever) in cattle was an epoch in the science of disease. Similar results were obtained with regard to fowl cholera; and his experiments show success in preventing the various diseases caused by septic bacteria, by inoculating animals with a milder form of the disease by means of a weaker brood of bacteria, artificially cultured. In 1883 he studied cholera in Egypt. Pasteur found that by keeping a cultured crop of specific micro-organisms at a certain temperature with a full supply of oxygen, he could reduce the organisms to an incapacity for producing spores, therefore to sterility; but before this point is reached it is claimed that the cultured organism loses its virulence, although still germinating; and vaccination with it produces a mild disease, which effectually protects from the fatal scourge of splenic fever, of fowl's cholera, and other diseases. In the same manner he dealt with splenic apoplexy (q.v.), which disease he has shown to be due to the presence in the blood of small organisms, specific bacteria. By artificially cultivating these bacteria he further succeeded in developing a weaker crop of germs. By inoculating healthy animals with the virus he produced a milder form of the disease, which is believed to afford protection from the more violent and dangerous malady. He in like manner treated hydrophobia (q.v.). He died Sept. 28, 1895. See GERM THEORY: KOCH.

PASTILE, PASTIL, or PASTILLE, a diminutive of paste. This term was originally applied to lozenges as little portions of confectionary paste, but it has been of late chiefly confined to a mixture of odorous materials, as in the case of the *fumigating pastilles,* which are burned either as incense or as a means of diffusing an agreeable odor. They are composed of charcoal powder, with such aromatic gums as benzoin, labdanum, etc.; and powders of sweet-scented woods and barks, as sandal-wood, cinnamon, and especially cascarilla barks. Essential oils are also added, and the whole are worked into a paste with a little gum-mucilage, and formed into small sharp-pointed cones about an inch and a half high, and half an inch broad at the base. When perfectly dry they are used by lighting at the point, and as they burn down an agreeable odor is given out with the smoke. Very tasteful vessels, called pastille burners, usually of porcelain, are made for using them. Another kind of pastille, usually in the form of a small pill covered with gold or silver leaf, is used for perfuming the breath; it is made of the same kind of ingredients, excepting the charcoal.

PASTON LETTERS, THE, a collection of letters written during the Wars of the Roses by or to the members of the family of Paston in Norfolk. They had been preserved in that family for several generations, then passed through a succession of hands, till they reached Mr. John Fenn, who published them in 5 vols., 1787–94. The authenticity of the series, at first assailed by many historical students, has now been settled beyond a doubt.

PASTOR, a genus of birds of the starling family (*sturnidæ*), differing from starlings in the compressed and slightly-curved bill. In habits, as in characters, they are very nearly allied to starlings. The name pastor is supposed to be derived from their being frequently seen with flocks of sheep. The only European species is the ROSE-COLORED PASTOR, or rose-colored ouzel (*P. roseus*), a rare visitant of Britain and of the northern parts of Europe, and more common in the n. of Africa, Syria, and India.

PASTORAL LETTER, a letter addressed either at certain stated times, or on the occurrence of some notable occasion, by a "pastor," but especially by a bishop to the clergy under his jurisdiction, to the laity of his flock, or to both. Of the former class, in the church of Rome, are the so-called lenten mandates, or instructions, issued before the commencement of lent, and making known the regulations enacted for the observance of the lenten fast, the dispensations granted, and the devotions and other pious works prescribed. Such also are the letters issued by a bishop on many of the chief festivals of the year. It is usual for bishops, besides their stated letters, to address to their clergy or people instructions suited to any particular emergency which may arise, and sometimes to take occasion from the issuing of the stated pastoral letter to offer instruction on some topic of importance which may engage public attention at the time, on some prevalent abuse or scandal, or some apprehended danger to the faith or to morals. To this class belong many of the remains of the early fathers, especially in the western church. In some countries the government, as formerly in Austria, claimed a right to exercise a censorship over the pastoral letters to be issued by the bishops. This right, however, is regarded by churchmen as a usurpation, and although submitted to, is admitted only under protest. See PLACETUM REGIUM, FEBRONIANISM.

PASTORAL POETRY is that kind of poetry which professes to delineate the scenery, sentiment, and incidents of shepherd life. It is highly probable that the first attempts to give a rhythmic expression to human feeling were to some extent of this character. Men were originally shepherds, and their festal songs and hymns would derive at least substance and imagery from their primitive occupations; but as a distinct branch of poetic art, pastoral poetry was not cultivated till a comparatively late period; for although critics are fond of pointing to the lives of the Hebrew patriarchs, and to the story of Ruth, as specimens of the antiquity of the pastoral in the east, yet, as these profess to be history, and not fiction, they can be instanced only to prove that the *material* for this kind of poetry existed from the earliest ages. In point of fact, it was only after innocence and simplicity had passed away, or were thought to have passed away, from real life, that men began, half from fancy, and half from memory, to paint the manners of the past as artless, and the lives of their ancestors as constantly happy. It was thus the *brass* age that made the *golden*. The oldest specimens of the classic pastoral are the Idylls of Theocritus (q.v.), which appeared about 275 B.C.—long after Greece had produced her masterpieces in epic narrative, in the war ode, and almost all other kinds of the lyric, in tragedy, comedy, history, philosophy, and rhetoric. Theocritus was imitated by Bion and Moschus, whose pastorals approximate in form to the drama. Among the Latins, the refined and courtly Virgil, in the reign of Augustus, wrote his *Bucolica* or *Eclogues*, on the model of his Greek predecessors; but, however beautiful and melodious the verses of these urban writers are, we cannot suppose for a moment that the rude shepherds and shepherdesses of Italy or Sicily indulged in such refined sentiments, or spent their time so poetically as there they are made to do. Virgil, we may rest assured, is as far from giving a genuine picture of pastoral life in his verse as any modern poet who prates of Chloe and Phyllis.

During the middle ages, pastoral poetry in this artistic, and therefore conventional, sense of the term, was almost unknown; but with the first glimpse of reviving classicism, the pastoral reappears. The earliest specimens are afforded by Boccaccio (q.v.), about the first modern Italian who studied Greek. It is to the countrymen of Boccaccio that we owe the creation of the pastoral drama, of which there is no trace in ancient literature. The *Favola di Orfeo* of Poliziano (q.v.), performed at the court of Mantua in 1483, is the first dramatic poem which pretends to represent the sentiments, incidents, and forms of pastoral life. Critics have forgotten this work when they make Tansillo the inventor of the *favola pastorale*, or *boscareccia*, on account of his *I due Pellegrini* (1539), or Agostino Beccari, whose pastoral comedy, *Il Sacrifizio*, was played at Ferrara in 1554. However, it is true that the extraordinary popularity of Beccari's piece originated a crowd of *favole boscareccie*, the finest and most poetical of which is the *Aminta* of Tasso, represented at the court of Ferrara in 1572. A later, but hardly less famous production is the *Pastor Fido* of Guarini (q.v.), published at Venice in 1590; and in the 18th c. the poet Metastasio (q.v.) revived for a moment the interest in this graceful and picturesque, but unreal branch of literature. In Spain, during the first part of the 16th c., it abundantly flourished. The first who wrote pastoral dialogues was Juan del Elcina (*cir.* 1500); he was followed by Garcilaso de la Vega, and others. During the reign of the emperor Charles V., one may say that Spanish imaginative literature was almost wholly of a bucolic character; but in Spain, as elsewhere, it took largely the form of prose-romance (see NOVELS) rather than of poetry, deriving its inspiration from the *Daphnis* and *Chloe* of Longus, the Byzantine romancist, not from the tuneful strains of the Mantuan swan. England, however, can boast of Spenser's *Shepherd's Calendar*, which is at least full of charming poetry, and is appropriately dedicated to sir Philip Sidney, whose pastoral romance of *Arcadia* outstrips in point of literary beauty all other fictions of that class. The Germans reckon Shakespeare's *As You Like It* in the list of pastoral dramas; but its right to be so classified is by no means clear, although we may admit that it betrays the influence of the pastoral poetry and romance that had just ceased to be the rage among the scholarly geniuses of Europe. A similar influence is visible in the writings of other

Elizabethan dramatists, as, for example, in the *Faithful Shepherdess* of Fletcher. In France, pastoral poetry is perhaps older than in any of the western nations. The comedy of Adam de Lehalle, surnamed Le Bossu d'Arras (The Hunchback of Arras), entitled *Le Jeu de Robin et Marion* (and which exists in MS, in the *Bibliothèque Impériale*), belongs to the middle of the 13th century. During the civil wars in the latter half of the 16th c. the pastoral was turned to political uses. In the following century, it continued for some time to be popular, or rather, let us say, fashionable. Even the great Richelieu alleviated the cares of office with the composition of *La Grande Pastorale*; but here, too, the poem soon gave way to the prose-romance, which was hardly less unreal, and far more exciting.

Perhaps the best pastoral, ancient or modern, is the *Gentle Shepherd* of Allan Ramsay (q.v.), published in 1725. "It is," says Mr. Carruthers (Chambers's *Cyclopædia of English Literature*, vol. i., p. 601; p. 523 of 3d ed.), "a genuine picture of Scottish life, but of life passed in simple rural employments, apart from the guilt and fever of large towns, and reflecting only the pure and unsophisticated emotions of our nature. The affected sensibilities and feigned distresses of the Corydons and Delias find no place in Ramsay's clear and manly page. He drew his shepherds from the life, placed them in scenes which he actually saw, and made them speak the language which he every day heard—the free idiomatic speech of his native vales." His English contemporaries, Pope, Ambrose Philips, Gay, and others who form the "Augustan," or queen Anne school of poets, also addicted themselves to the composition of pastoral poetry; but though there is much fine description in the verses, they are, in general, purely conventional performances, in imitation of the classic poets, who, as we have said, did not themselves imitate nature. From this censure, however, must be excepted the six pastorals of Gay, entitled the *Shepherd's Week*, which are full of honest country humor, and contain charming pictures of English country life. Since the early part of the 18th c., however, pastoral poetry, strictly so called, has ceased to be cultivated in England and almost everywhere else. In the pages of Wordsworth, who lived all his days among the Cumberland shepherds, we indeed find many exquisite glimpses of pastoral life, as it presented itself to the profound and tender imagination of that great poet of nature, but few direct delineations of pastoral manners. Germany imitated abundantly the French and Italian models during the greater part of the 18th century. The last and best of the German series is the *Erwin and Elmire* of Goethe's youth. The general impression appears to be that the age of pastoral poetry has passed away forever, and that Damon and Chloe will never reappear in verse.

PASTORAL STAFF, sometimes also, although not properly, called crosier (q.v.) (Lat. *baculus pastoralis*), one of the insignia of the episcopal office, sometimes also borne by an abbot. It is a tall staff of metal, or of wood ornamented with metal, having, at least in the western church, the head curved in the form of a shepherd's crook, as a symbol of the pastoral office. The head of the pastoral staff of an archbishop, instead of the crook, has a double cross, from which its name of *crosier* is derived. In the Greek church the staff is much shorter, and the head is either a plain Greek cross or the form of the letter *Tau*, or it is a double-headed crook, which sometimes appears in the shape of the upsilon, *Υ*. It is difficult to determine the time at which the pastoral staff first came into use. The first distinct allusion to it is in St. Augustine's commentary on the 124th psalm. Gregory of Tours, in his life of St. Martin, mentions the pastoral staff of St. Severinus, who was bishop of Cologne in the end of the 4th century. From an early time the pastoral staff was connected with the actual possession of the jurisdiction which it symbolizes. The giving of it was one of the ceremonies of investiture; its withdrawal was part of the form of deprivation; its voluntary abandonment accompanied the act of resignation; its being broken was the most solemn form of degradation. So also the veiling of the crook of an abbot's pastoral staff, during the episcopal visitation, signified the temporary subjection of his authority to that of the bishop. An abbot being required to carry his pastoral staff with the crook turned inwards, showed that his authority was purely domestic. The pope alone does not use a pastoral staff. In the later mediæval period the material was often extremely costly, and, referring to the relaxation of the times, it was said "that formerly the church had wooden pastoral staves and golden bishops, but that now the staves are of gold and the bishops of wood." The workmanship was sometimes extremely beautiful. The Irish pastoral staff is of a type quite peculiar, and some of the sculptured specimens preserved in the British museum, at the royal Irish academy, and elsewhere, are very interesting as illustrating the ecclesiastical costume of the period.

PASTORAL THEOLOGY, that branch of theological science which regards the duties and obligations of pastors in relation to the care of souls. It comprises two parts; first, that which treats of the obligations of the pastors themselves, and which is therefore designed for the training and preparation of the candidates for the pastoral office. The other part of pastoral theology, which might perhaps better be called popular theology, comprises the objective teaching which is to be employed in the instruction and direction of the flock committed to the pastor's charge. This branch of theology has long formed a leading portion of the training of candidates in the evangelical churches of France and Germany. Numerous works on the subject represent the practice of the various sections

of the Protestant church; and more recently Catholic manuals of pastoral theology have appeared.

PASTRY, articles of food in which the chief part consists of a paste made of flour. This would of course apply to bread, but it has been limited by custom to such lighter articles as are made by the pastry-cook, and chiefly to those in which the paste is made to assume a light flaky character by the addition of butter, etc., and by the mode of working it up. The commonest kind is made of a dough of flour and water, into which butter or lard is worked by hand, in the proportion of six ounces to the pound. The finest kind is usually termed *puff paste,* and considerable skill is required to make it well, for it depends, next to the goodness of the materials, upon lightness of hand in kneading the ingredients together. These ingredients consist of fine wheaten flour and butter in the proportion of four ounces of butter to a pound of flour, with cold water just sufficient to make a good stiff elastic dough; this is rolled out with a *rolling-pin,* and double the previous quantity of butter is then spread over it. It is then rolled up and lightly kneaded, so as to work the butter in thoroughly. Coolness is very important in making pastry; a marble slab is therefore most desirable for making it upon. The thinner it is rolled out before the butter is then spread the better, because when it is put in the oven the laminæ which have been formed by folding or rolling up the butter with the dough, separate by the disengagement of the watery vapor, and the thinner and lighter the flakes are the better is the puff paste. Another kind is called *short paste;* in this the flour is made warm, and the butter or lard used is often melted, and a little sugar and an egg or two are added. This, when baked, has none of the flaky character of puff paste, but it is better adapted for meat and some other kinds of pies which require to be baked without a dish. Game pies, with elaborately-decorated crusts, are made of this pastry.

PASTURAGE, in English law called common of pasture, is classed among rights of common or profits *à prendre,* and is the right of one who is not the owner of land to put his sheep or cattle on such land to feed there. In Scotland it is called a servitude of pasturage. In both countries the right can be established by prescription, in England of thirty years, and in Scotland of forty years. Where the parties entitled to pasturage dispute as to their respective proportions of cattle, the suit to redress the matter is called in Scotland an action of "sowming and rowming."

PASTURES (Lat. *pasco,* to feed) are fields or tracts of land devoted to the feeding of oxen, sheep, and other herbivorous animals, which eat the grass and other herbage as it grows. Grass is grown sometimes in the rotation with grain and other crops, when it remains on the ground for one or more years, is frequently mown during the first summer, and grazed afterward, but is again plowed up to be succeeded usually by oats or wheat. For such purposes, rye-grass, red, white, yellow, and alsike clovers, are used either alone or mixed in varying proportions. On the uplands of Great Britain, wherever from any cause grain crops cannot profitably be grown, and throughout many of the richest plains and valleys, especially of England and Ireland, there are thousands of acres of land which have been under grass from time immemorial. Such permanent pastures are estimated to occupy fully 14,000,000 acres in England, nearly 8,000,000 in Scotland, and about 9,000,000 in Ireland. Sometimes they have been self-sown, occasionally they have been laid down with care, seldom are they as highly cultivated and liberally managed as they should be. The best of them are used for feeding heavy bullocks; those of somewhat poorer description are often grazed by dairy stock; while the down or upland pastures are especially profitable for sheep. It has now become a common practice, and is every year becoming more and more general, to give additional food of various kinds to animals fed on pastures. Even cattle grazing on the richest pastures are supplied with linseed cake, etc., to hasten the process of fattening, and to improve their quality; roots are given to sheep when fattening for the market, and hay to those which are to be kept as stock; whilst when oats or beans are cheap, many sheep-farmers find it advantageous to give them even to the hardy stock of exposed hill-pastures. All pastures are much improved by thorough drainage. The application of farmyard dung, soil, lime, and almost every sort of top-dressing is beneficial. Irrigation is sometimes profitable, and in some other countries is far more common and far more requisite than in Britain. Rich pastures on which oxen are fed are injured by sheep, which reject the coarsest grass, and pick out the finest; but a few horses turned into them during the autumn or winter help to consume the coarser tufts. The coarsest and rankest grass may once or twice a year be cut over by the scythe; and either made into rough hay, or if left on the ground, the cattle, when it has partially dried, will readily eat it up. A dressing of lime and salt scattered over the rougher parts of the fields in autumn will sweeten the herbage, and induce the stock to eat it down regularly. Moss, which is a great pest in many pastures, may be got rid of by penning sheep, well fed with swedes, cake, or corn, regularly over the field; or by harrowing the surface in several different directions during January or February, applying then a top-dressing of soil or dung, and in March or April sowing some clover or other seeds, which will be firmed down by the bush harrow, clod-crusher, or heavy roller. The droppings of the cattle ought to be broken up and scattered over the ground. Rich pastures intended for the fattening of cattle ought not to be used during winter, but allowed to become luxuriant before the cattle are turned upon them in spring. Very lean animals, whether

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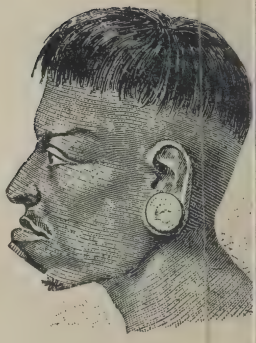

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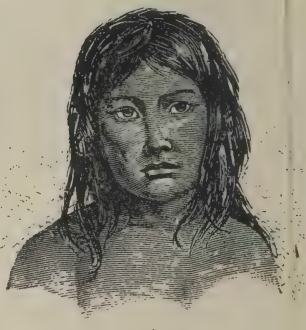

10

PATAGONIA, BRAZIL, PERU, ETC.—1. Patagonian family. 2, 3. Botocudos (Brazil). 4. Pu
8. Puru girl. 9. War-dance of Juri (Patagonia). 10. Camacuan (Brazil). 11. Wapisi
14. Case. 15. Forehead ornament.

(Brazil) in their hut. 5. Miranhas (Brazil). 6. Young Botocudo. 7. Patochu hut.
Indians (Guiana). 12. Makusi house (Guiana). 13. Carvings from Peruvian graves.

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oxen or sheep, cannot with advantage be at once placed on very rich pasture, but must be gradually fitted for it. In some of the hill districts in Scotland, devoted to sheep farming, increased productiveness has resulted from breaking up portions of the pasture, and after two or three crops have been taken, laying them down as pastures again. All good pastures produce a very mixed herbage, not consisting merely of one kind of grass, but of several or many, with clovers and other plants. Different species of meadow-grass (*poa*), fescue (*festuca*), foxtail (*alopecurus*), oat-grass (*avena*), cock's-foot (*dactylis glomerata*), rye-grass (*lolium*), hair-grass (*aira*), vernal-grass (*anthoxanthum*), and timothy or cat's-tail (*phleum*), are among the most common grasses of British pastures. Yarrow (*achillæa millefolium*) is very abundant in some pastures, and is sometimes sown with grass, clover, etc., in land meant for permanent pasture. Different kinds of clover are adapted to different soils and situations. The presence of rushes is very indicative of the want of drainage. Thistles and docks are injurious, and are to be extirpated as much as possible. Some of the plants naturally abundant on high hill-pastures, as *nardus stricta* and *juncus bufonius*, are very unnutritious; and the substitution of others in their stead, is one of the benefits derived from the breaking up of such lands.

PATAGONIA, the most southern region of South America, extending from lat. 39° southward to the strait of Magellan, and occupying the extremity of the continent. Since 1881, nearly the whole country east of the watershed has been formally recognized as part of the Argentine Republic, while Chili, which previously claimed a considerable share of that area, has contented herself with the country to the west and a strip along the southern coast. Length upwards of 1000 m., greatest breadth about 480 m.; area about 235,000 sq.m.; pop. estimated with considerable doubt at about 20,000. The coast of the Atlantic has extensive bays and inlets, none of which, however, are of much importance or advantage, in a commercial point of view. Along the western coast, and stretching from 42° s. to the strait of Magellan, are numerous islands, with precipitous shores, belonging apparently to the system of the Cordilleras. The principal islands are Chiloé, the Chonos archipelago (q.v.), Wellington island, the archipelago of Madre de Dios, Queen Adelaide's archipelago, and Desolation island. These islands—which, together with several peninsulas, form a coast almost as rugged as that of Norway—are mountainous; but in none of them, except in Desolation island, do the mountains rise to the snow-line.

Surface, Soil, etc.—The country of Patagonia divides itself into two regions, very unequal in size and very different in character. These are eastern and western Patagonia, which are divided by the great mountain range of the Andes. Western Patagonia, comprising this range, the coast districts, and the islands, is rugged and mountainous. Opposite the island of Chiloé are two active volcanoes, one of which, Minchinmavida, is 8,000 ft. high. The slope of the country from the Andes to the Pacific is so steep, and the strip of shore so narrow, that the largest river of this district has its origin only about 13 m. from its embouchure on the coast. In the island of Chiloé, in the n. of western Patagonia, the mean temperature of winter is about 40°, that of summer rather above 50°; while at port Famine, in the extreme s. of this region, and 800 m. nearer antarctic latitudes than Chiloé, the mean temperature is not much lower, being in winter about 33°, and in summer about 50°. This unusually small difference in the mean temperature of the extremes of western Patagonia, which extends over about 14° of lat., is due to the great dampness of the atmosphere all along the coast. The prevailing winds of this region blow from the w.; and heavily surcharged with the moisture they have drawn from the immense wastes of the Pacific ocean, they strike against the Andes, are thoroughly condensed by the cold high mountains, and fall in rains that are almost perpetual from Chiloé to the strait of Magellan. South of 47° s. lat., hardly a day passes without a fall of rain, snow, or sleet. This continual dampness has produced forests of almost tropical luxuriance. A kind of deer wanders on the e. side of the mountains; guanacos, pumas, and water-fowl abound in the region between the Andes and the Atlantic; and along the coast, seals, otters, sea-elephants, fish, and shell-fish are found.

Eastern Patagonia comprises by far the larger portion of Patagonia, and extends eastward from the Andes to the Atlantic. Its surface has not yet been thoroughly explored, but the recent wanderings of Mr. Musters have at last furnished us with some authentic information. It mainly consists of high undulating plains or plateaus, frequently intersected by valleys and ravines, or rising into successive or isolated hills, which generally occupy the crest of the country. These plateaus are occasionally covered with coarse grass, but more frequently the surface is sterile, with a sparse vegetation of stunted bushes and round thistle clumps; and even these are sometimes wanting, absolutely nothing clothing the bare patches of clay or gravel; elsewhere it is strewn with huge round bowlders, and again rugged with confused heaps or ridges of bare, sharp-edged rocks, many of them of volcanic origin. Piercing blasts sweep almost incessantly from various points, but chiefly from the w. As this wind has parted with its moisture, hardly any rain falls in Argentine Republic during seven or eight months of the year. The descent from these plains or pampas to the valleys or more sheltered and fertile ground bordering the banks of the streams and rivers, is commonly termed "barranca," or bank, from the scarped slopes, varying in depth from 50 to 2 or 3 ft., and in angle from an easy to an almost perpendicular descent. The soil in many places is strongly impregnated with saltpeter, and salt-lakes and lagoons are numerous. North

of the Rio Chico, and towards the sea-coast, there is a wild, weird, desolate region called by the Indians "The Devil's Country;" it is said to be almost impassable. Several inhospitable wastes of this kind fringe the Atlantic, and have probably induced the belief that Patagonia is a barren and waterless desert; but the interior, though not fertile, really abounds in lagoons, springs, and streams, and the banks of the Rio Negro and even the Santa Cruz are capable of cultivation. Along the eastern base of the Andes, also, there is a great tract of territory which is astonishingly picturesque and fertile. Here great forests abound, to which the Indians retire for shelter from the freezing winds of winter. There are also deep valleys furrowed by mountain torrents; and numerous lakes, the haunts of wild-duck and other water-fowl. The largest of these lakes are Nahuel Huapi in the n., Coluguape in the middle, and Viedma in the south. Except pasture, eastern Patagonia has no productions. However fertile the soil in some places may be, it is nowhere cultivated. The Indians live upon the produce of the chase alone, and seem to desire no better sustenance. The principal rivers are the Rio Negro (q.v.); the Chupat, which flows through a good soil, producing excellent pasture and good firewood ; the Rio Deseado, probably rising in lake Coluguape ; and the Rio Chico, which flows out of lake Viedma, through a valley sometimes opening out into wide grass-covered plains dotted with incense bushes, and sometimes rising in huge, bare ridge and burrow-like undulations. All these rivers rise in the Andes, and flow e. or s.e. Herds of horses are reared, dogs abound, and, in the more favored regions, cattle are bred; pumas and foxes are met with, as well as condors, hawks, partridges, and water-fowl. But by far the most important animals are the guanaco or huanaca (q.v.); the rhea darwinii, called by the Patagonians *mekyush*, and by the Spaniards *avestrus* or ostrich; and the gama, a kind of deer.

Inhabitants.—The Patagonians have been hitherto described only in the most general terms, and in many cases very inaccurately. Little was known of their appearance, habits, and employments. The work of M. Guinnard, *Trois Ans d'Esclavage chez les Patagons* (1864) was for a time believed to form a valuable addition to our knowledge of Patagonia and its inhabitants; but the publication of Mr. Musters's record of his travels from the straits of Magellan to the Rio Negro, under the title of *At Home with the Patagonians* (1871), has utterly destroyed the Frenchman's claim to be an authority. Mr. Musters is decidedly of opinion that M. Guinnard was never in Patagonia at all, and that his "experiences" were confined to the Indians *north of the Rio Negro.*

The Patagonians or Tehuelche Indians are divided into two great tribes, the northern and the southern. They speak the same language, but are distinguishable by difference of accent; and the southern men appear to be on an average taller and finer, and are more expert hunters. The northern range chiefly over the district between the Cordillera and the Atlantic, from the Rio Negro to the Chupat, and even the Santa Cruz river. The southern occupy the rest of Patagonia as far south as the strait of Magellan. The two divisions, however, are much intermixed, and frequently intermarry. The question is often asked: "Are the Patagonians of gigantic stature?" Mr. Musters's statement is: "The average height of the Tehuelche male members of our party with which I traveled was rather over than under 5 ft. 10 inches." Two others, measured carefully by Mr. Clarke (while resident at Santa Cruz), stood 6 ft. 4 in. each. The muscular development of the arms and chest is extraordinary, and in general, the Patagonians are well proportioned. They are splendid swimmers, can walk great distances without being tired, and can go for two and even three days without being tired. As an illustration of their strength of arm, Musters mentions that he has seen them "ball" an ostrich over 70 yards distant. The expression of their face is ordinarily good-humored, except in the settlements: their eyes are bright and intelligent, their noses aquiline and well-formed, their foreheads open and prominent. The complexion of the men, when cleansed from paint, is a reddish brown. Thick flowing masses of long hair cover their heads, and are combed out by their wives at least once a day. The scanty natural growth of beard, mustaches, and even eyebrows, is carefully eradicated. The young women are frequently good-looking, displaying healthy, ruddy cheeks when not disguised with paint. The dress of the men consists of a *chiripa* or undergarment round the loins, made of a poncho, a piece of cloth, or other material; a long mantle of hide, worn with the fur inside, and drooping in unbroken outline from their shoulders to the ground; and potro boots or buskins made from the skin of horse's hock, and occasionally from the leg of a large puma. The dress of the women is similar, except that the undergarment is made of calico or stuff sack, and extends from the shoulders to the ankle. Both sexes are fond of ornaments, wearing huge ear-rings of square shape, suspended from small rings passing through the lobe of the ear; also silver or blue bead necklaces. The reason assigned for the use of paint is that it forms a protection against sun and wind, and Musters states that he "found from personal experience it proved a complete preservative from excoriation or a chapped skin."

The arms of the Tehuelches consist of gun or revolver; sword or dagger; a long, heavy lance, used only by dismounted Indians, and altogether different from the light lance of Araucanian and Pampa horsemen; and the *bola perdida*, or single ball, so called because, once thrown from the sling, it is not picked up again.

Their houses, called *toldos*, are formed of three rows of stakes driven into the ground. The middle row is higher than the others, and the three rows are tied together with

strings of hide, and so kept in their place. This frail framework is covered with hides which reach the ground on all sides, and are fastened to it by small stakes of bone. At night-fall, guanaco hides are spread on the ground within the tents, and the men and women, laying aside their mantle, their only garment, and which sometimes serves as a blanket, go to sleep under the same roof and in the same apartment. Bathing in cold water every morning, throughout the whole year, is a custom to which men, women, and children conform; and although the morning bath may not free them from vermin —a national characteristic—yet it has the effect of preventing disease, and of enabling them the more easily to endure the severities of winter. Their only manufactures are mantles of guanaco hide, and saddles, bridles, stirrups, and lassos. The lassos and the articles of harness are chiefly plaited, and evince wonderful ingenuity and nicety of execution.

The religion of the Patagonians (according to Mr. Musters) is distinguished from that of the Pampas and Araucanians by an absence of any trace of sun-worship. They believe in a great and good spirit who created the Indians and animals, and who dispersed them from a place which they call "God's hill;" but Mr. Musters is inclined to think that this belief owes its origin to a confused apprehension of the story of creation as told by the Christian missionaries. Curiously enough, this great and good spirit takes no concern with the beings whom he has created. Idols are unknown, and during the whole of his wanderings Mr. Musters saw no trace of any periodic religious festival. Whatever religious acts the natives performed were prompted by their dread of malicious demons, the chief of whom, Gualichu, is always on the watch to cause mischief. To propitiate or drive away this spirit is the function of the wizard, doctor, or medicine-man, who (as in other countries) combines the medical and magical arts. The Gualichu lurks outside the *toldos*. He is invisible (except to the "doctor," who has the gift of second-sight), and he can enter into the bodies of people, and cause sickness and disease of every sort. Besides the Gualichu, there are, as has been said, many other evil spirits, who are supposed to inhabit subterranean dwellings, underneath certain woods and rivers and peculiarly shaped rocks, all of whom are saluted on occasion with special incantations. The cry of the nightjar on the Cordillera betokens sickness or death; a certain toad-like lizard mysteriously lames horses; a fabulous two-headed guanaco is a sure forerunner of epidemic disease, etc. To counteract the influence of these, charms and talismans are liberally employed.

Their language is quite different from either Pampa or Araucanian. "Though able to converse in Tehuelche," says Mr. Musters, "I could not at all understand the Pampas; and this is noted with reference to statements made in M. Guinnard's work, which, coupled with other internal evidences . . . . compel me to doubt that the author was ever in the hands of the real Patagonians." The same writer has a more favorable opinion of their character than is common. He found them "kindly, good-tempered, impulsive children of nature, taking great likes or dislikes, becoming firm friends or equally confirmed enemies." They are, however, "steadily and rapidly decreasing," through the combined effect of disease and bad liquor supplied to them by traders at the stations; and before long the race will be extirpated. The oldest of these stations is Patagones (formerly El Carmen), on the north side of the Rio Negro, about 18 m. from its mouth, in the Argentine country. It has a pop. of about 2,000, composed of Spanish and other settlers, negroes, and convicts from Buenos Ayres At the mouth of the Chupat there was from 1865 till 1870 an unprosperous Welsh colony; at the mouth of the Santa Cruz, further s., there is also a petty station; and at Punta Arenas (Sandy Point), on the strait of Magellan, the Chilian government have established a colony and a penal settlement.

See *At Home with the Patagonians: a Year's Wanderings over the Untrodden Ground from the Straits of Magellan to the Rio Negro*, by George Chaworth Musters (Lond. 1871); and *Across Patagonia*, by Lady Dixie (1880). See also works by Beerbohm and Coan.

PÂTÂLA (from *pat*, fall) is, in Hindu mythology, the name of those inferior regions which have seven, or, according to some, eight divisions, each extending downwards 10,000 *yojanas*, or miles. The soil of these regions, as the *Vishnu-Purâna* relates, is severally white, black, purple, yellow, sandy, stony, and of gold; they are embellished with magnificent palaces, in which dwell numerous dânavas, daityas, yakshas, and great snake-gods, decorated with brilliant jewels, and happy in the enjoyment of delicious viands and strong wines. There are in these regions beautiful groves, and streams and lakes, where the lotus blows, and the skies are resonant with the kokila's songs. They are, in short, so delightful, that the saint Narada, after his return from them to heaven, declared among the celestials that Pâtâla was much more delightful than Indra's heaven. Prof. Wilson, in his *Vishnu-Purâna*, says "that there is no very copious description of Pâtâla in any of the *Purânas;* that the most circumstantial are those of the *Vâyu* and *Bhâgavata Purânas;* and that the *Mahâbhârata* and these two *Purânas* assign different divisions to the dânavas, daityas, and nâgas. . . . The regions of the Pâtâla and their inhabitants are oftener the subjects of profane than of sacred fiction, in consequence of the frequent intercourse between mortal heroes and the serpent-maids. A considerable section of the *Vrihat-Kathâ* consists of adventures and events in this subterraneous world." For inferior regions of a different description, see NARAKA.

PATANJALI is the name of two celebrated authors of ancient India, who are generally looked upon as the same personage, but apparently for no other reason than that they bear the same name. The one is the author of the system of philosophy called Yoga (q.v.), the other the great critic of Kâtyâyana (q.v.) and Pânini (q.v.). Of the former, nothing is known beyond his work—for which see the article YOGA. The few historical facts relating to the latter, as at present ascertained, may be gathered from his great work, the *Mahâbhâshya*, or "the great commentary."

PATAP'SCO, a river of Maryland, rises on the northern boundary of the state, and flows south-easterly 80 m. to the Chesapeake bay, 14 m. s. of Baltimore, to which city it is navigable. Its falls furnish water-power to numerous factories.

PATARENES, or PATERENES, a name given in the 11th c. to the extreme opponents of clerical marriages. The party was led by Arialdus, a deacon of Milan, where its members used to meet in the Pataria, or ragman's quarter, *pates* being a provincial name for a rag. Early in the 13th c. the title, from an erroneous idea that it came from the word *pati*, to suffer, was appropriated by the Cathari, who condemned marriage altogether.

PATCH, SAMUEL (1807–1829), was born in Rhode Island, but little is known of his early life, except that he went to sea when very young. After a few years he returned and settled in Paterson, N. J., where he learned the trade of cotton spinning. Much was being said at this time about jumping, and he became possessed with a desire to jump from a bridge recently built over the Passaic at that point. It was a distance of about ninety feet, and the leap was considered so dangerous that he was finally placed under arrest; but a few months later he performed the feat successfully. This was in 1827, and it gave him such wide-spread popularity that he left his trade and traveled about giving exhibitions of his skill by leaping from the yard-arms or top-masts of ships. In the course of these exhibitions he made a trial in Rochester, N. Y., that he considered a partial failure, so he advertised that he would make another trial there, in which he would jump from the bank of Genesee river into the depths just below the falls, a distance of 125 feet. While waiting the day for this performance he went to Niagara and jumped from a projecting rock on Goat Island, a distance of nearly a hundred feet. At the appointed time, November 13, 1829, he made the leap into the Genesee river, but he never rose to the surface, and nothing was seen of his body for many months. It was finally found, and was buried at Charlotte, near the mouth of the Genesee river.

PATCHOGUE' a village and port of entry in Suffolk co., Long Island, N. Y., on the shore of Great South bay, and the Long Island railroad; 54 miles e. of New York. It has a public library, union school, Latin school, electric lights, state and savings banks, Holly system of waterworks, large oyster and fish interests, and manufactories of lace curtains, paper, and brass goods. It was incorporated in 1893. Pop. '90, not reported.

PATCHOU'LI. This very interesting material is the dried branches of *pogostemon patchouli* (natural order *labiatæ*), which was first introduced to this country as an article of merchandise in 1844. The plant is a native of Silhet, the Malay coast, Ceylon, Java, the neighborhood of Bombay, and probably also of China; but owing to the fondness of Asiatics for the perfume which it yields, it is difficult to say where it is native or cultivated. Every part of the plant is odoriferous, but the younger portions of the branches with the leaves are chosen; they are usually about a foot long. The odor is peculiar and difficult to define, but it has a slight resemblance to sandal-wood; it is very powerful, and to many persons is extremely disagreeable. The odor of patchouli was known in Europe before the material itself was introduced, in consequence of its use in Cashmere to scent the shawls with a view of keeping out moths, which are averse to it; hence the genuine Cashmere shawls were known by their scent until the French found the secret, and imported the herb for use in the same way. Its name in India is *pucha-pat*, and it is there used as an ingredient in fancy tobaccos, and as a perfume for the hair. It is also much prized for keeping insects from linen and woolen articles. The essence of patchouli is a peculiar heavy brown oil, with a disagreeably powerful odor; it is obtained by distillation, and requires extreme dilution for perfumery purposes.

PÂTÉ DE FOIE GRAS, sometimes called Strasburg pie, a dish greatly esteemed by epicures, and, as the name indicates, made of the livers of abnormally fattened geese or ducks. Strasburg and Toulouse are the chief places of manufacture, the *pâtés* are exported to every part of the world, and the trade amounts to several hundred thousand dollars annually. The fowls are fed to repletion with salted maize, and by this means the liver is increased to the unnatural weight of 2 or even 3 lbs.

PATEL'LA, or KNEE-CAP, is a sesamoid bone (q.v.), developed in the single tendon of the *rectus, vastus externus,* and *vastus internus* muscles—the greater extensor muscles of the leg. It is heart-shaped in form, the broad end being directed upwards and the apex downwards. The anterior or external surface is convex, perforated by small apertures for the entrance of vessels, and marked by rough longitudinal striæ, while the posterior or internal surface is smooth and divided into two facets by a vertical ridge, which corresponds and fits into the groove on the lower articulating surface of the femur or thigh-

bone, while the two facets (of which the outer is the broader and deeper) corresponds to the articular surface of the two condyles.

This bone is liable both to dislocation and fracture. Dislocation may occur either inwards or outwards; but it is most frequent in the outward direction. The displacement may be caused either by mechanical violence, or by too sudden contraction of the extensor muscles in whose conjoined tendon it lies; and is most liable to occur in knock-kneed, flabby persons. It may be readily detected by the impossibility of bending the knee, and by the bone being felt in its new position, and, except in one rare variety, the dislocation is capable of being reduced without any difficulty. Fracture of the patella may (like dislocation) be caused either by muscular action or by mechanical violence.

Fracture by muscular action is the more common of the two forms, and occurs thus: A person in danger of falling forwards attempts to recover himself by throwing the body backwards, and the violent action of the extensors (chiefly the *rectus*) snaps the patella across, the upper fragment being drawn up the thigh, while the lower portion is retained *in situ* by that portion of the common tendon which is continued from the patella to the tubercle of the tibia, and which is called the ligamentum patellæ. The treatment consists in relaxing the opposing muscles by raising the trunk, and slightly elevating the limb, which should be kept in a straight position. In consequence of the great difficulty of bringing the broken surfaces into exact apposition, it is very difficult to obtain bony reunion of the parts, and the case generally results either in mere ligamentous union or in no true union at all.

PATELLA and **PATELLIDÆ.** See LIMPET.

PA'TEN (Lat. *patina*, a dish), the plate employed for the elements of bread in the eucharistic service. Anciently it was of considerable size; and while the practice of the offertory (q.v.) continued, there was a special paten for the bread-offering. In the Roman Catholic church, in which the unleavened wafer-bread is used, and the communion is distributed from a distinct vessel called pyx (q.v.), the paten is a small circular plate, always of the same material with the chalice. It is often richly chased or carved, and studded with precious stones. It is used only in the mass.

PATENT, an exclusive right granted by an official document and securing to a person for a term of years the exclusive privilege of making, using, and selling something invented by him. The protection given covers new and useful arts, by which results are obtained in a cheaper, easier, or more advantageous manner; machines, or improvements thereof; manufactures, in the sense of essentially new fabrics or products, and designs connected with such manufactures; and compositions which result from new combinations of ingredients already in use. The articles newly discovered or invented must not have been surrendered to the public openly or by implication, and improvements must not have been patented or described in any printed publication, or sold to or used by the public for more than two years previous to the application of the patentee. It is often the case that the most useful inventions bring but little pecuniary gain to the discoverer, and, again, that from some very simple modification of an article large profits will occur.

Patents are issued in the name of the United States, and under the seal of the Patent Office, to any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, and not in public use, or on sale for more than two years prior to his application, unless the same is proved to have been abandoned; and by any person who, by his own industry, genius, efforts, and expense has invented and produced any new and original design for a manufacture, bust, statue, alto-relievo, or bas-relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture to be printed, painted, cast or otherwise placed on or worked into any article of manufacture; or any new, useful, and original shape or configuration of any article of manufacture, the same not having been known nor used by others before his invention or production thereof, nor patented nor described in any printed publication, upon payment of the fees required by law and other due proceedings had.

Every patent contains a grant to the patentee, his heirs or assigns, for the term of seventeen years, of the exclusive right to make, use, and vend the invention or discovery throughout the United States and the Territories, referring to the specification for the particulars thereof.

If it appear that the inventor, at the time of making his application, believed himself to be the first inventor or discoverer, a patent will not be refused on account of the invention or discovery, or any part thereof, having been known or used in any foreign country before his invention or discovery thereof, if it had not been before patented or described in any printed publication.

Joint inventors are entitled to a joint patent; neither can claim one separately. Independent inventors of distinct and independent improvements in the same machine cannot obtain a joint patent for their separate inventions.

PATENT OFFICE. The business of the United States Patent Office previous to 1836 was conducted by a single clerk in the office of the secretary of state. The act of 1836 provided for the appointment of 4 clerks, one to act as examiner, and also of a draughts-

man, machinist, and messenger. Provision was also made for the establishment of a library. From this slender beginning has grown the immense establishment now occupying nearly the whole of the building of the department of the interior at Washington, and employing between four and five hundred persons. The Patent Office, as the building is usually called, is of marble, freestone, and granite; 453 ft. long, 331 ft. wide, and 75 ft. high, in Doric architecture. The model rooms occupy the upper story, and consist of 4 halls, 1350 ft. in length, and containing more than 200,000 models of patents. The capacity of the building is now taxed to its utmost, and it is thought by many that models have been required in many cases where drawings would answer the purpose. A recent rule of the office provides that applicants need not furnish models unless officially notified to do so. The model rooms are open to the public. Below are the offices of the commissioner, his assistant, and about 70 examiners divided into several classes. In the ten years ending Jan. 1, 1850, 5,941 patents were issued; from 1850 to 1860, 21,428; from 1860 to 1870, 77,315; from 1870 to 1880, 140,375. The ratio of this increase to that of the increase of pop. is sixfold. As compared with foreign nations the amount of business done in the Washington office is the largest in the world. The charge for application for a patent is $20 in the United States, against $50 in Canada, $75 in England, $100 in most continental countries, $300 in Russia and most British colonies, and $400 in Portugal and British India. These fees are for the application only, and subsequent fees are in proportion. In the year ending June 30, 1880, the number of patents issued was 12,471 (1629 less than in 1879); of trade marks, 1141; and of labels, 403. The total expenditure of the office was $548,651.47, and the receipts $703,146.79. By authority of congress the office issues weekly a *Gazette*, containing lists of the patents issued, description, and specifications of the more important, with engravings, notice of new rules adopted, and accounts of patent litigation, and decisions of the U. S. courts. The department also issues a pamphlet entitled *How to Obtain Patents*, sent free on application, which contains minute direction as to the course to be taken by inventors. We add a schedule of the present patent fees of the United States: On filing application, $15; on issuing original patent (17 years), $20; on application for re-issue, $30; on application for extension, $50; on granting extension of patent (7 years), $50; on each caveat, $10; on appeal to examiners-in-chief, $10; on appeal to commissioner of patents, $20; on filing a disclaimer, $10; on application for design (3½ years), $10; on application for design (7 years), $15; on application for design (14 years), $30; on each trade mark (30 years), $25; on each label (28 years), $6.

The receipts of the Patent Office during the fiscal year 1889–90 were $1,347,203, and expenditures, $1,081,174. Receipts over expenditures, $266,029.

The following is a statement of the business of the office for the fiscal year ending June 30, 1890:

Number of applications for patents	40,201	Number of patents granted, including reissues and designs	25,857
Number of applications for design patents	1,003	Number of trade-marks registered	1,332
Number of applications for reissue patents	121	Number of labels registered	304
Number of applications for registration of trade-marks	1,617		
Number of applications for registration of labels	868	Total	27,493
Number of caveats filed	2,330	Number of patents withheld for non-payment of final fees	3,403
Total	46,140	Number of patents expired	11,885

The total number of applications filed at the Patent Office, in fifty-four years, 1837–90, was 742,583; number of caveats filed, 91,165; number of patents issued, 475,785. Receipts, $25,349,584; expenditures, $20,354,110. Net surplus, $4,995,474.

PATENTS, LAW OF (see PATENT; PATENT OFFICE), though originally used to include the alleged authority for granting monopolies and the law of copyright, is now confined to the granting by the sovereign power in the state of certain immunities, privileges, and authority as to the making, use, and sale of useful articles newly discovered or invented and not already openly or by implication surrendered to the public; or as to the employment of some newly discovered process in art or manufactures. The privileges are continued for a limited time. To the inventor the consideration is the profit to be derived from the sale or use of the invention; to the public the consideration is, first, the stimulation of invention; secondly, the free public use of the invented article after the limited time expires. It is noticeable that the first patent granted in this country, 1641, was for a new *process*, that of making salt. Several others were granted before the revolution, under the royal charter, or by the authority of colonial statutes, the most important instances occurring in Connecticut and Massachusetts. By the U. S. constitution power was conferred upon congress to pass statutes "securing for limited times to authors and inventors the exclusive right of their respective writings or discoveries." The first statute was that of 1790. This fixed the limit at 14 years, or less, at the discretion of the grantors, who were to be the attorney-general and the secretaries of state and of war. The approval of any two of these sufficed. A foreigner could receive a patent. Fees were fixed; infringers were made liable to punishment, but no provision was made for the examination of the claims. The act was found deficient, and in 1793 a second was passed which introduced the principle of deciding interfering claims and made the form of petition to the secretary of state alone. Triple damages were to be paid by infringers; the fee was fixed at $30, and a method was provided for bringing disputed claims before a U. S. district court. The act of 1800 compelled the applicant to make oath that the invention had not been previously known or used in this or *any foreign*

country. These and other acts and amendments, in 1819 and 1832, were rendered void by the act of 1836, which, though changed in many points by subsequent statutes (1837, '39, '42, '48, '49, '52, '60, '61, '70, '72), forms the basis of our present regulations. This statute had for its marked features the establishment of a separate office (see PATENT OFFICE), the appointment of a commissioner as its head officer, and of another officer to examine the patentability of claims, and the introduction of the system of *caveats*. The fee to foreigners (except aliens resident here one year) was $500 if subjects of Great Britain; to others $300. A board was appointed to which appeal could be made from the decisions of the commissioner and examiner. The power of extending the patent for 7 years, after the expiration of the 14 was granted to a board of three commissioners. Reference must be made to the statutes for the details of changes made by later acts. Among the more important were: that of 1839, providing that an "abandonment" to the public must have taken place two years before the application for the patent, to justify refusal of the grant; that of 1848, extending the powers of the commissioner; of 1849, transferring the office from the department of state to that of the interior; of 1861, extending the term from 14 to 17 years, withdrawing the power of extension from the commissioner, removing the distinction between U. S. citizens, and those of nations not discriminating against this country in the matter, fixing the fees at $15 on application and $20 on issue of the patent, and establishing a "board of examiners-in-chief," to whom there is an appeal from the decisions of the primary examiner. The act of 1870 differed from the then existing statutes only in unimportant particulars. Under the present law patents are granted to aliens as well as to citizens, the only requirement being that the invention shall be original; and to this rule the exception exists that as against a previous knowledge or use in other countries it is necessary for the applicant to show only that he believed himself to be the original discoverer at the time of application. Executors and administrators of a deceased inventor may receive the patent, and the grant may issue to two or more jointly. An extension for 7 years may be obtained on paying an application fee of $50, and the same sum on issue. In applying for a patent a specification must be presented describing the nature and principle of operation of the invention, with a detailed account of the relation of the different parts, and a distinct statement of what is claimed as new. This must be signed and attested by two witnesses, and accompanied by a sworn statement of the applicant's *bona fide* belief of the originality of his invention. Wherever possible, a model, not to exceed a foot in the length of any dimension, must be furnished; and in case of a composition of matter, samples of the ingredients and specimens of the composition should be forwarded. The application is by petition to the commissioner of patents; by him it is referred to one of a number of primary examiners, each having charge of a special class of inventions. On the approval of such examiner the patent is granted; if adverse cause be found, an opportunity is given the applicant to remove the objection by explanation or proof. If unsuccessful he may appeal to the three examiners-in-chief; from this board he may again appeal to the commissioner, whose decision is final, unless reversed by the supreme court of the district of Columbia. A *caveat* is a paper filed by an inventor, briefly stating the nature of his intended claims, and accompanied by a fee of $10. Its effect is to secure the applicant for one year from the granting of any patent interfering with his claim, and thus allow him time to mature his invention. The *caveat* may be renewed from year to year. If application for an interfering patent be made, notice is given to the filer of the *caveat*, and he must then within three months make the regular application. The question of priority of invention is then tried as in other cases; and in all, appeal lies to the district supreme court. A *re-issue* is granted on the surrender of the old grant and a request to amend it in certain specified points; new claims cannot be introduced into the re-issue; the amendment must be for mistakes or errors by which the original intent of the grant was rendered void or incompletely carried out. No extension beyond the term of 17 years is now allowed. Patents are granted for designs, artistic, ornamental, or connected with manufactures. The question of *trade marks* (q.v.) was formerly closely connected with the patenting of designs. The patent takes effect from the day of issue.

What *subjects-matter* are properly within the domain of patent law and what is necessary to constitute a patentable invention or discovery, are important questions. As to the first the language of the statute provides for the granting of patents to the inventor "of any new and useful *art, machine, manufacture,* or *composition of matter,* or any new and useful improvement thereof." The term manufacture is construed in a more limited sense than in the patent laws of most foreign countries, as it is used exclusive of machinery and compositions. Under the head of "art" are included all patentable processes, or methods. It is often difficult to tell within which classification a specified invention properly falls, but it is sufficient that its nature is such as to bring it within the limits of one or more of the four classes. Every discovery does not entitle the discoverer to an invention. Thus a mere enunciation of a scientific theory, abstract principle, or philosophical truth, is not patentable. But if such principle be so reduced to a practicable and tangible form, so as to be a concrete construction of component parts, or structure capable of producing useful results, this will be patentable. It is not necessary that all parts of the invention be new, but what is new must produce some tangible useful effect or improvement. Where two or more existing processes or parts of machinery are for the first time united, if a new effect be produced, the combination is patentable, other-

wise not. No invention injurious to public morality, or which would assist crime, can be patented. But an invention of a process or tool which would be useful in legitimate business cannot be rejected on the ground that it might also be of aid to burglars or counterfeiters. That which is useful is also to be distinguished from that which is trivial or frivolous, but a glance at the patent office models will quickly dispel any fear that undue severity is exercised on this point. "Double use" is not patentable, that is, a new use of a process or machine already in use for a different purpose, is not considered a new invention. A mere substitution of one substance or element (or, in a process, of a chemical ingredient) will not be considered, if the two have the same function only. A patentable *process* is one which by the application of some principle or natural law, such as the application of one form of matter to another, or by chemical action, produces some new and useful effect. Important instances are the patented processes used in manufacturing vulcanized india-rubber, in smelting ores, and in making high grades of steel. An abandonment by an inventor may be inferred from his neglecting to make objection to the use of his invention by unauthorized parties within his knowledge, or from unreasonable delay in making application after the completion of the invention. If the latter be in public use for two years before the time of application the inventor's claim is absolutely forfeited. To constitute such public use it is necessary to show only a single instance. When a patent has been granted and application is made by a second person, claiming priority of invention, it is too late for the "interference" investigation by the patent office, and the only course for the commissioner to pursue is to grant a second patent to the applicant, if he feel warranted by the facts, and thus leave the parties to contest their rights on an equal footing in the courts.

Patents are the subject of sale in whole or in part, and may be mortgaged or assigned. Such assignment must be recorded at the patent office to protect the assignee against a vendee or mortgagee claiming through the original patentee. Licenses to use an invention may be written or oral, but cannot be assigned to a third party without special authority. A contract to sell or assign an invention not yet patented is a good executory contract, but actual sale or assignment is null. To constitute infringement of a patent there must be the making, use, or sale to another of that which is the subject matter of an existing patent. The test is whether the two are not substantially identical. Changes in form, relative position, or substitution of one material for another, will not save an infringer from the penalties attached to infringement. Damages may be recovered by the patentee in an action on the case in courts of common law, or by equity proceedings. In the former method the measure of damage is the actual damage incurred; in the latter the infringer may be compelled to account for the profits received by him, and a temporary or permanent injunction may be obtained. Notice must be given of the patentee's right by marking the article with the word "patented" and the date of issue. Penalties are provided for the wrongful use of such mark or stamp. The best work on patents in this country is that of George Ticknor Curtis; Phillips and Fessenden are also standard authors. The latest English work is that of Agnew.

PATER, Walter Horatio, was b. in London, August 4, 1839. He was educated at the King's school, Canterbury, and in 1858 entered Queen's college, Oxford, where he graduated B.A. in 1862. He was elected to a fellowship at Brasenose College, and after filling various offices in this institution, took the degree of M.A. in 1865. Mr. Pater traveled extensively in Italy, France, and Germany. In 1866 he made his first contribution to literature in the form of an essay on the writings of Coleridge, which appeared in the January number of the *Westminster Review*. In 1873 he published in *Macmillan's Magazine* a series of studies in art and literature entitled *The Renaissance*, of which a second edition appeared in 1877; *Marius, the Epicurean: His Sensations and Ideas*, in two volumes, appeared in 1885. This work reached its second edition for both England and America. Mr. Pater also contributed extensively both to the *Fortnightly Review* and *Macmillan's Magazine*. Among these contributions may be mentioned *Wordsworth; The School of Giorgione Dionysius; Charles Lamb; The Beginnings of Greek Sculpture*, in the former; *A Prince of Court Painters; Sebastian Van Storck*, and others, in the latter. He was the contributor to Ward's *English Poets* of the sketches on Coleridge and Rossetti. His last work was *Plato and Platonism* (1893). He d. in 1894.

PATER'CULUS, G. Velleius, a Roman historian, descended from an ancient and wealthy Campanian family, is thought to have been b. about 19 B.C. He entered the army at an early age, and from 4 to 12 A.D. served under Tiberius as prefect or legate in Germany, Pannonia, and Dalmatia. He was a great favorite with Tiberius, and when the latter became emperor, 14 A.D., Paterculus was appointed pretor. He was alive in 30 A.D., as his history comes down to that year; but it is conjectured that in the following year he was probably put to death as one of the friends of Sejanus, of whom he speaks highly in his work. Paterculus's claim to remembrance is his *Historiæ Romanæ*, a compendium of universal, but more particularly of Roman history, in two books. The work, as we have it, is not complete; the beginning, and a portion following the 8th chapter, being wanting. It seems to have commenced with the fall of Troy; and describes only the most prominent historical incidents, but these, fortunately, with considerable fullness of detail. Scholars are satisfied that it is a work of a man who is, on the whole, impartial and discriminating. The style is based on that of Sallust. The *editio princeps* of the *Historiæ Romanæ* appeared at Basel in 1520; the most valuable is

Ruhnken's, on account of its excellent notes (Lugd. Bat. 1789), reprinted by Frotscher (Leips. 1830-39); but Orelli's (Leips. 1835) has the least corrupt text.

PA'TERNOSTER (Lat. "Our Father") called also THE LORD'S PRAYER, a short form of prayer suggested or prescribed by our Lord to his disciples (Matt. vi. 9-13, Luke xi. 1-4) as the model according to which, in contrast with the prayers of the Pharisees, their petitions ought to be composed. The paternoster has been accepted as, by excellence, the form of Christian prayer. It formed part of all the ancient liturgies. So sacred, indeed, was its use, that it was reserved from pagans and catechumens under what is known as the discipline of the secret. The early fathers—Origen, Tertullian, Cyprian—refer to it in terms which show that even then it was a recognized form of private prayer. It was recited in baptism, and one of the privileges of the baptized was the use of the paternoster. More than one of the fathers, and very many later writers, have devoted special treatises to the exposition of this prayer, as embracing all the fitting and legitimate objects of the prayer of a Christian. The catechism of the council of Trent contains a detailed exposition and commentary of it, and in all the services, not only of the Roman missal, breviary, ritual, processional, and ordinal, but in all the occasional services prescribed from time to time, it is invariably introduced. In the rosary (q.v.) of the Virgin Mary, it is combined with the hail Mary (whence the larger beads of the "rosary" are sometimes called *paternosters*), and perhaps the most usual of the shorter devotions among Roman Catholics is the recitation of the "pater," with one or more "Ave Marias," concluding with the doxology. The paternoster as commonly used by Protestants concludes with the clause, "for thine is the kingdom, and the power, and the glory for ever. Amen." This clause is not used by Roman Catholics. Of the two gospels—that of Matthew and that of Luke—in which the prayer is contained, that of Luke has not this clause; and even in the gospel of Matthew it is found only in the later MSS., in which it cannot be doubted that it is a modern interpolation. It was retained, however, in Luther's German translation, and in the authorized version, whence its use became common among Protestants. Many polyglot collections of the paternoster have been published from the 16th c. downwards, the most remarkable of which are those of John Chamberlayne in 150 languages (1715), of Conrad Gesner in 200 (1748), and that of Padre Hervaz in 307 (1787).

PATERSON, city and co. seat of Passaic co., N. J.; on the Passaic river, the Morris canal, and the New York, Lake Erie, and Western, the New York, Susquehanna, and Western, and the Delaware, Lackawanna, and Western railroads; 16 miles n.w. of New York. It was founded in 1791 for a great manufacturing center; was incorporated as a city in 1851; and is widely known as the Lyons of America. The greater part of the city lies in a curve of the river, which has a perpendicular fall of 50 ft. at this point, supplying a great water power, and a decline of 20 ft. more to the plain. The manufactures, which make this the third city in the state in importance, include silk and silk goods, jute, paper, iron and steel, locomotives, machinery, engines, boilers, linen thread, malt liquors, etc. The U. S. census of 1890 reported 599 manufacturing establishments, which employed $27,603,549 capital and 24,232 persons, paid $11,578,082 for wages and $22,480,727 for materials, and had an output valued at $42,263,531. The silk factories are the most important in the U. S., employing over 11,500 persons, and producing goods valued at more than $22,000,000. The city has East and West side parks, a soldiers' monument, public library, county buildings, opera house, high school and many grammar schools, about 50 churches, hospitals, asylums, national and savings banks, and daily and weekly newspapers. The streets are broad, well paved and drained; there are several lines of electric street railroad, and efficient police and fire departments. The water supply is drawn from the Passaic. Pop. '90, 78,347.

PATERSON, WILLIAM, the most celebrated, after John Law (q.v.), of the commercial schemers of the 17th c., was, like Law, a Scotchman, and was b. in the parish of Tinwald, Dumfriesshire, in 1658. His early career is obscure, but before he was 30 he was a merchant, carrying on considerable transactions with the West Indies and other countries. It was he who first projected the bank of England (incorporated in 1694), and he was one of the original directors. He is best known, however, in connection with the famous Darien scheme, of which he was the prime mover, and which obtained the royal sanction in 1695. This project came to ruin in a few years; but the scheming activity of Paterson continued unabated. When, in 1701, William resolved to carry the contest with Louis XIV. into the heart of Spanish America, Paterson was taken into the king's confidence, and, but for that monarch's death, might have seen his dreams of Darien realized. He had a considerable hand in the union of Scotland with England. He d. 1719.

PATHOLOG'ICAL ANATOMY, or the anatomy of diseased organs, is included in, but must not be confounded with pathology, as until comparatively lately was often the case. It is merely a section—although a most important section—of pathology, contributing (as Prof. Vogel has well remarked "to practical medicine the solid materials from which to construct a basement, without having the power to erect a perfect edifice." Pathological anatomy enables the surgeon to decide whether a suspicious tumor is malignant or of a comparatively harmless nature, and in many other ways is of the greatest importance to surgery; and although at first sight it might appear to be of small importance in relation to therapeutics, this is not in reality the case. Scientific treatment

necessarily demands an accurate knowledge of the material changes which lie at the foundation of the various morbid symptoms. Hence pathological anatomy not only forms a portion of the positive basis of therapeutics, but it also points out the processes by which the different altered parts may be gradually restored to their normal condition. It not merely indicates what requires healing, but in many cases also the course that must be adopted in order to aid the curative tendency of nature. It likewise serves as a check on therapeutics, exposing, in a most conclusive manner, the absurdity of many pretended methods of cure. It points out, for example, that in a certain stage of inflammation of the lungs (pneumonia) a fibrinous fluid separates from the blood, and by its coagulation renders a portion of the tissue of the lung impermeable to air; and further that it requires several days for this coagulated matter to resume the fluid condition and to be removed. If any one should assert—and such assertions have often been made—that in this stage of the disease he could apply a remedy which would cure the patient in a few hours, a very slight knowledge of pathological anatomy would show the folly of such an assertion. The best English works on this subject are Vogel's *Pathological Anatomy of the Human Body*, and Jones and Sieveking's *Manual of Pathological Anatomy*.

PATHOLOGY (from the Gr. *pathos*, disease, and *logos*, a discourse) is that department of medicine which treats of the doctrine of morbid actions or diseases. In this country the term is so far restricted as not to include the causes, treatment, etc., of diseases, but the most eminent French and German writers regard it as equivalent to "the theory and practice of medicine," and consider it as treating not only of the classification, causes, symptoms, and physical signs of diseases, but as also including their seat, the phenomena which precede and follow them, their progress, their duration, their modes of termination, the different forms in which they occur, their complications, the changes to which they give rise in the solids and fluids of the body, and their treatment.

PATKUL, Johann Reinhold, 1660–1707; b. in a prison at Stockholm; of a noble Livonian family; educated for a soldier, attained the rank of capt., but his fame rests principally on his talent for diplomacy. He was prominent in the controversies between the Livonian nobility and the king of Sweden. Having incurred the displeasure of the king he was summoned to Stockholm for trial, was condemned as a rebel, sentenced to death, and his writings destroyed. He escaped to Courland, but his estates were confiscated about 1694. He resided subsequently in Switzerland and France, and busied himself with scientific studies. In 1698 he sued for pardon, was refused, and entered the service of Augustus II. of Saxony, king of Poland; was appointed one of his privy council, and was influential in bringing about the alliance formed against Charles XII. by Augustus II., Peter the Great, and Frederick IV. of Denmark. He made a journey to Russia as ambassador, won the favor of the czar, and became Russian ambassador to Dresden with the rank of gen. In 1705 Augustus II. had him arrested and imprisoned at Königstein, and surrendered him to Charles XII. as one of the conditions of peace (giving secret orders to further his escape), but he was taken out of Saxony by the Swedes, and by the command of Charles was broken on the wheel and beheaded at the convent of Kazimierz near Posen.

PATMORE, Coventry Kearsey Dighton, b. England, 1823; appointed an assistant librarian at the British museum in 1846, and held that position till 1868. His first publication was a volume of *Poems* in 1844. His subsequent works are: *Tamerton Church Tower and other Poems* (1853); *The Angel in the House* (1854–62); *A Garland of Poems for Children* (1862); *The Unknown Eros* (1877); *A Memoir of Barry Cornwall*, and *Amelia* (1878), and his collected poems (1886). He d. in 1896.

PAT'MOS, a bare and rocky island in the Ægean sea, about 45 m. in circumference. It belongs to the group called the Sporades, lies to the s. of Samos, and is now called Patino, but in the middle ages *Palmosa*, although there is now only one palm-tree in the whole island. It is celebrated as the place to which the apostle John was exiled, and where he saw the visions recorded in the book of Revelation. On the top of a mountain stands the famous monastery of "John the Divine," half way up to which a cave is pointed out to the traveler in which, according to tradition, the apostle received his revelations. See Ross's *Reisen auf den Griechischen Inseln des Agäischen Meeres*, and Guérin's *Description de l'Ile de Patmos*, etc. (Paris, 1856).

PATNA, a district of British India, bounded n. by the districts of Sarum, Tirhoot, and Monghyr; e. by that of Monghyr; s. by those of Monghyr and Behar; w. by that of Shahabad; the length from e. to w. is 85 m; breadth, 45; 2079 sq. miles. The Ganges flows along its n. border, and the Son, a tributary of the Ganges, forms the w. and n.w. boundary, and is navigable for a considerable distance. The soil is fertile and well cultivated. Rice, wheat, and barley are grown in abundance. The opium poppy is extensively raised. The climate is very hot in summer, but the winters are mild. The district is traversed by the East India railway, and by several roads. Patna was ceded to the English in 1765. During the mutiny of 1857 every part of the district except the capital was occupied by the rebels. Pop., '81, 1,756,856.

PAT'NA, or more correctly, Pattana (i.e., the town), an important trading city of Hindustan, capital of a British district and division of the same name in Bahar, presidency of Bengal, stands on the right bank of the Ganges, and 140 m. e. of Benares.

The city proper, forming a quadrangle, extends a mile and a half along the river-side, and is half that extent in breadth. Patna is generally supposed, however, to include the suburbs, which stretch on each side of it, on the s. bank of the Ganges. The European quarter is on the w. of the town proper. Here are a church, chapel, Roman Catholic cathedral, government offices, school, the nabob's palace, the great tank, and several noteworthy mosques and tombs. The streets of Patna are covered with mud and slime in winter, and its air is thickly impregnated with choking dust in summer. Pop. '91, 165,200, of which 124,500 were Hindus and 40,100 Mohammedans.

Patna, under the former name of *Padmavati*, is supposed to have been the capital of Bahar, 419 years B.C. Here, at an early period, the English established factories, and traded in opium, rice, etc. In 1763 disputes about transit-duties arose between the company's servants and the native government. A war ensued, resulting in the British taking possession of the district. Patna was the headquarters of the Wahabi or Mussulman conspiracy in 1864. Chief seat of the opium trade; trade also in table-linen, wax candles, toys, bird-cages, and talc-pictures. The division of Patna has an area of 23,467 sq. m., and a pop. of about 15,000,000, the great majority of whom are Hindus and Mohammedans.

PATOIS (of uncertain derivation), the French term applied to corrupt dialects of a language spoken by the uneducated. See DIALECT.

PATON, Sir JOSEPH NOEL, R.S.A., one of the most distinguished living Scottish artists, was born in Dunfermline in 1821. It is understood that in early life he employed himself in making designs for the damask manufacturers of his native place, and for the muslin and lace embroiderers of Paisley. He, however, soon turned his attention to the walk of art proper, and his cartoon sketch, "The Spirit of Religion," gained one of the three premiums at the Westminster Hall competition in 1845. Two years thereafter his oil picture of "Christ bearing the Cross," and his "Reconciliation of Oberon and Titania," jointly gained the prize of £300. He subsequently executed a companion-picture to the "Reconciliation," entitled the "Quarrel of Oberon and Titania;" and both now adorn the royal Scottish academy's galleries in Edinburgh. These pictures made the artist's reputation Although somewhat hard and dry in color, and without any retiring and shadowy depth, they are full of brilliant fancy; and the multitudes of figures, and the variety of fairy incident, affect the spectator much in the way that the constant sparkle of Congreve or Sheridan affects the reader. He has since painted much more simply and powerfully. "Dante Meditating the Episode of Francesca," was exhibited in Edinburgh in 1852; and the "Dead Lady," a work of great and solemn pathos, in 1854. In 1855 his great picture, "The Pursuit of Pleasure," was exhibited in that city, where it was much criticised and much admired. He has since painted "Home from the Crimea," a *replica* of which is in the possession of her majesty; and "In Memoriam," a scene from the Indian mutinies; and for the association for the promotion of the fine arts in Scotland, a series of picture illustrations of the "Dowie Dens o' Yarrow." Among his other pictures of importance are "Dawn: Luther at Erfurt," "The Fairy Raid," "Faith and Reason," "Gethsemane," "Christ and Mary at the Sepulcher," "The Man of Sorrows," "Mors Janua Vitæ," "The Spirit of Twilight," "Thy Will be Done" (1879), etc. Many of his works have been engraved, and are deservedly popular. Along with his brother he illustrated Aytoun's *Lays of the Scottish Cavaliers*, and in 1864 he executed twenty illustrations of the *Ancient Mariner*. Paton was appointed queen's limner for Scotland in 1865, received the honor of knighthood in 1867, and in 1876 was made LL.D. by Edinburgh university. He has published two volumes of poems.

PATONCE, CROSS, in heraldry (Lat. *patens*, expanding), a cross with its terminations expanding like early vegetation or an opening blossom.

PATOS, LAGO DES. See RIO GRAND DO SUL.

PATRAS (ancient *Patræ*, Turk. *Baliabadra*), a fortified sea-port, and the most important trading town in the w. of Greece, in the government of Achaia and Elis, stands on the eastern shore of the gulf of the same name, 70 m. w. n.w. of Corinth. It is overlooked by the strong citadel — on the site of the ancient acropolis — crowning a ridge, on the southern slopes of which the ancient city, as well as the modern one before the revolution, was built. The Patras of to-day stands on a level space close to the sea. The plain of Patras is exceedingly valuable for the currants grown, and which are the most important export of the town. Its harbor, though protected by a mole, is unsafe, and exposed to heavy seas. Earthquakes frequently occur, and most of the houses are on that account only of one story. Capotes are made here of mixed wool and goat's hair; and, besides currants, oils, valonia, raw silk and cotton, wool, hides, wax, etc., are exported. Patras is by far the most important commercial town on the continent of Greece, though it suffered severely during the Greek revolution. Pop. '89, 33,529.

Patræ is the only one of the "twelve cities" of Achaia which still exists as a town, but most of its relics have been swept away by earthquake and revolution.

PATRIA POTESTAS is the term used to express the power which the civil law gave to the Roman father over his children, and which has been the foundation of the greatly modified paternal authority recognized in modern systems of jurisprudence. The right

of a parent to control his child not come to years of discretion is a part of natural law, but the more extensive *patria potestas* of the Romans was probably a relic of those early times in which families, or tribes considered as families, led a wandering pastoral life in dread of each other, under the guidance of a chief, whom it was necessary to invest with an almost unlimited authority.

By the Roman law, the *patria potestas* was acquired naturally, by the birth of a child in wedlock, or civilly, by legitimation or adoption. An unemancipated son or daughter, a grandchild by a son, or any other descendant by males, was viewed as a part of the parent's property. In early times a father had the power of life and death over his children: by the laws of the twelve tables he could sell them as slaves, or could transfer them to another family by adoption. Under the republic, the despotic authority exercised by fathers over their offspring was practically limited to a considerable extent by the censors, and several emperors issued constitutions to restrain the cruelties often perpetrated by fathers towards their children. First the right of sale, and then that of life and death was taken away. Alexander Severus restricted the right of the father to moderate chastisement, and Constantine declared that the father who should kill his son was to be held guilty of murder. By the early Roman law, the son, being in his father's power, could not acquire property for himself; his acquisitions all belonged to his father; hence he was incapable of making a testament. There were, however, particularly in later times, modes by which he could acquire *peculium*, or property which should be independent of his father. A father might give his son property to trade on, which would be his own; and latterly a son acquired for himself whatever he gained in military service, or by the discharge of certain civil functions. In all matters belonging to the *jus publicum* a son was independent of his father; he could vote at the elections, hold the most important offices of state, or command the army. He could also be a tutor, tutory being considered a *munus publicum*. In later times a son promoted to the consular dignity ceased to be under the restraints of paternal control, but, unlike an emancipated son, he retained his rights of succession. Lawful children were entitled to aliment from their parents; an obligation attached in the first instance to the father and mother, and, failing them, to the grandfather. Until the time of Justinian, illegitimate children had only a claim for support against their mother; that emperor gave them a right to demand aliment from their father.

In no modern system has the paternal power been carried so far as under the Roman law. According to the French "code civile," a child is under the authority of his parents till majority or emancipation; up to that time he cannot quit the paternal residence without leave of his father, except for enrollment in the army at 18 years of age. Majority is attained at the age of 21, but a minor is emancipated by marriage. At 15 a minor may be emancipated by his father, or, if his father be dead, by his mother, by a simple declaration before a magistrate. The father possesses somewhat extensive powers of chastisement. He may obtain a warrant to arrest his child under 16, and detain him in prison for a month; and an order may be obtained for the incarceration for six months of a child above 16, on cause shown to the satisfaction of the magistrate. Parents are entitled to the usufruct of their children's property till the age of 18 or emancipation, subject to the burdens of maintenance and education; but this right does not extend to property acquired by the industry of the children, or bequeathed by a stranger under the condition of an exclusion of paternal interference.

By the law of England, a father is guardian to his lawful children in minority, though this right ceases to some extent at 14. He has the power of moderate chastisement. As guardian he receives the rents of any real estate which the child may possess, which he must account for when majority is attained. The paternal power never extends beyond majority, and, to some effect, marriage acts as an emancipation. A father may by deed appoint a guardian to such of his children as are unmarried at his death till thay attain majority.

This term is still recognized in the modern civil law, though its meaning is very different from what it was under the Roman law. It is now practically vested in both parents alike, though generally, as a matter of fact, exercised by the father; and when there is a difference of opinion his will prevails. Parents are entitled to the use of the property of minor children, subject, of course, to the obligation of properly supporting and educating them. In all legal matters the father acts as the general guardian of the child. The father may also designate by will a proper person as guardian for his children after his death, and such a person will become a "testamentary guardian." The power over the child for purposes of correction and training must be exercised with care, and excessive corporal punishment will be looked upon as a misdemeanor.

PA'TRIARCH (Gr. *patriarches*, the head of a tribe) is the name given to the heads of the families in the antediluvian period of Scripture history, and is still more familiar as the designation in Jewish history of the three progenitors of the Jewish people, Abraham, Isaac, and Jacob. In the later history of the Jews, too, after the destruction of Jerusalem, the name was used to designate the heads of the sanhedrim, one of whom, the patriarch of the west, resided at Tiberias, in Galilee, and the other, the patriarch of the eastern Jews, at Babylon. The most familiar use of the word, however, is in the history of the Christian church. It is the name given to the bishops of certain great metropoli-

tan (q.v.) sees, who not only held rank beyond other metropolitans, but also enjoyed a jurisdiction almost identical with that of the metropolitan in his own province over all the metropolitans themselves (with their provinces) included in their district, which was called a PATRIARCHATE. The name patriarch originally seems to have been given commonly to bishops, or at least was certainly given in a less special sense than what it eventually assumed; nor can the date at which the title first assumed its now received use be exactly determined. It is certain, however, that the name and the office were both recognized before the council of Nice, at which time, as we learn from the sixth canon, the patriarchal sees, acknowledged by "ancient custom," were three in number, Rome, Antioch, and Alexandria. After the translation of the seat of empire to Byzantium, thenceforward called Constantinople, that see, originally subject to the metropolitan of Heraclea, obtained, first metropolitan, and afterward patriarchal rank; and eventually established a precedency over the patriarchs of Antioch and Alexandria, being second only to Rome. The contests between the patriarchs of Rome and Constantinople were among the chief causes of the GREEK SCHISM (see GREEK CHURCH). To these four patriarchates was added in 451 A.D. that of Jerusalem, which was formed out of the ancient patriarchate of Antioch. The limits of these five patriarchates can only be loosely assigned. The authority of a patriarch was, in the main, that of a metropolitan, but extended over the metropolitans themselves. He had a right to consecrate the metropolitans, and to preside over the councils of his patriarchate. After the Greek schism, and particularly after the establishment of the Latin kingdom of Jerusalem, Latin prelates were appointed with the title and rank of patriarch in the four great eastern sees. It was hoped that the union of the churches, effected at the council of Florence, would have put an end to the contest thus created; but that union proved transitory, and the double series of patriarchs has been continued to the present day. The Nestorian and Eutychian sections of the eastern churches, too, have each their own patriarch, and the head of that portion of the former which in the 16th c. was reconciled with the Roman see, although known by the title of *Catholicos*, has the rank and authority of patriarch. After the separation of the Russian church from that of Constantinople, the name and authority of the metropolitan in the end was transformed into that of patriarch. But the office was suppressed by Peter the great.

Besides these, which are called the greater patriarchates, there have been others in the western church known by the name of minor patriarchates. Of these the most ancient were those of Aquileia and Grado. The latter was transferred to Venice in 1451; the former was suppressed by Benedict XIV. France also had a patriarch of Bourges; Spain, for her colonial missions, a patriarch of the Indies; and Portugal a patriarch of Lisbon. These titles, however, are little more than honorary.

In the non-united Greek church, the ancient system of the three prtriarchates of Constantinople, Antioch, and Jerusalem is nominally maintained, and the authority of the patriarchs is recognized by their own communion. But the jurisdiction-limits of the patriarch of Constantinople, who is acknowledged as the head, have been much modified. The Russo-Greek church withdrew from him partially in the 17th, and finally in the 18th century. That of Greece proper has been practically separated since the independence of the kingdom of Greece; and some years since it formally declared its independence. The patriarchs of Jerusalem and Antioch have few followers of their own rite.

PATRIARCHAL CROSS, a cross which, like the patriarchal crosier, has its upright part crossed by two horizontal bars, the upper shorter than the lower. A cross patriarchal fimbriated or was a badge of the knights templars.

PATRICIAN (Lat. *patricius*, from *pater*, father), a name given to the members of Roman *gentes*, of whom the *populus Romanus* consisted, and to their descendants by blood and adoption. *Patres*, and *patricii* were in the early days of Rome synonymous; they were so named from the *patrocinium* which they exercised over the whole state, and all classes of whom it was composed. Niebuhr's researches have established that, until the *plebs* became a distinct order, the patricians were the entire citizens or *populus* of Rome; a select number of them were senators; and the original inhabitants, reduced to a condition of servitude, were known by the name of *clientes* or *plebs*. The amalgamation of the three tribes of Ramnes, Tities, and Luceres, gave rise to a distinction between *patres majorum gentium* and *patres minorum gentium*—the latter term being applied to families recently elevated to an equality with the old patrician class. On the establishment of the plebeians as a distinct order, sharing certain rights with the patricians, the patriciate became an aristocracy of birth, in the exclusive possession of a number of important privileges. A long struggle between the two orders ended in the attainment by the plebeians of a political equality, and the establishment of a new aristocracy of *nobiles* based on wealth and office. Under Constantine the dignity of *patricius* became a personal title; not hereditary, but conferring very high honor and certain privileges. It was created at Constantinople, and not confined to Romans or subjects of the empire, but sometimes bestowed on foreign princes. These patricians, unlike the old Roman order, were distinguished in dress and equipage from the ordinary citizens. The popes in after times conferred the same title on eminent persons and princes, including many of the German emperors. In several of the Germanic kingdoms the title of patrician

was bestowed on distinguished subjects; and in some parts of Italy the hereditary nobility are still styled patricians.

PATRICK, a co. in s.w. Virginia, having the state line of North Carolina for its s. border, a range of the Alleghany mountains on the w. and n.w., drained by Dan, Smiths, Mayo, and North and South forks, affluents of the Roanoke, rising in its w. section; 521 sq.m.; pop. '90, 14,147, chiefly of American birth, inclu. colored. Its surface is mountainous in the w. portion, containing features of great natural beauty for which the region is celebrated; in the e. it stretches into broad plains extensively covered with forests. Live stock is raised, and the soil is adapted to the production of grain, honey, sweet-potatoes, cotton, tobacco, and dairy products. Iron ore is the principal mineral product which is abundant. Co. seat, Stuart.

PATRICK, Saint, a distinguished missionary of the 5th c., commonly known as the apostle of Ireland. There is some uncertainty as to the date and place of his birth. The year of his birth is variously assigned to the years 377 and 387, of which the latter, if not even a later date, is more probable. Of the place, it is only known for certain, from his own confession, that his father had a small farm near Bonavem Taberniæ; and in one of the ancient lives he is said to have been born at Nemthur. Arguing on these data, connected with other collateral indications, some writers assign his birthplace to the present Boulogne-sur-Mer; others to a place in the estuary of the Clyde (called from him Kilpatrick) at or near the modern Dumbarton. His father, he himself tells, was a deacon named Calpurnius; his mother, according to the ancient biographers, was named Conches or Conchessa; according to some of these authorities, a sister of St. Martin of Tours. Patrick's original name is said to have been Succat, Patricius being the Roman appellative by which he was known. In his 16th year he was seized, while at his father's farm of Bonavem Taberniæ, by a band of pirates, and with a number of others was carried to Ireland, and sold to a petty chief, in whose service he remained for 6 years; after which he succeeded in effecting his escape, and, probably after a second captivity, went to France, where he became a monk, first at Tours, and afterwards in the celebrated monastry of Lerins. In the year 431 he went to Rome, whence he was sent by the pope of the day, Celestine, to preach in Ireland; Palladius, who had been sent as missionary to that country a short time before, having died. Such is the received account of his mission; but Dr. Todd, his latest biographer, regards this statement as erroneous, and fixes the date of his coming to Ireland 8 years later. He was ordained in France, and arrived in Ireland in 432. His mission was eminently successful. He adopted the expedient of addressing himself first to the chiefs, and of improving, as far as possible, the spirit of clanship, and other existing usages of the Irish for the furtherance of his preaching; nor can it be doubted that he had much success in Christianizing the ancient Irish system of belief and of practice. By degrees he visited a large portion of the kingdom, and baptized great numbers as well of the chieftains as of the people. According to the accounts of his Irish biographers, he founded 365 churches, and baptized with his own hand 12,000 persons. He is said also to have ordained a vast number of priests, and to have blessed very many monks and nuns. After he had been about 20 years engaged in his missionary enterprise, he is said to have fixed his see at Armagh about the year 454; and having procured two of his disciples to be ordained bishops, he held probably more than one synod, the decrees of which have been a subject of much controversy. He died at a place called Saul, near Downpatrick; and his relics were preserved at Downpatrick down to the period of the reformation. The place is still venerated by the people. The date of his death is much disputed; the Bollandists placed it in 460, while Ussher holds it to have been 493. Dr. Todd inclines strongly to the latter opinion, in which case Patrick's age would have been 126, or at least 116. The only certainly authentic literary remains of St. Patrick are his "confession" and a letter, both of very rude Latinity, but of much historical interest. The letter is addressed to Coroticus, who is supposed to have been a Welsh chieftain named Caradoc (from whom Cardigan is named), who had made a descent on the Irish coast, and slain or carried off, with circumstances of great cruelty, a number of the Irish, many of whom were neophytes. These, with some other remains ascribed to him, as also decrees of synods, were published in Wilkins's *Concilia,* and separately by Ware, *Opuscula S. Patricii Adscripta* (1656) and by Villanueva (Dublin, 1835). The latest biography of St. Patrick is that of the Rev. J. H. Todd, 1 vol. 8vo (Dublin, 1863). St. Patrick's Day is March 17th.

PATRICK, Saint, Order of, a national order of knighthood for Ireland, established by George III. on Feb. 5, 1783, and enlarged in 1833. As originally constituted, it consisted of the sovereign, the grand-master (who was always the lord-lieut. of Ireland for the time being), and 15 knights. By the statutes of 1833 the number of knights was increased to 22.

The *collar* of the order (of gold) is composed of roses alternating with harps, tied together with a knot of gold, the roses being enameled alternately white within red, and red within white, and in the center is an imperial crown surmounting a harp of gold, from which the badge is suspended. The *badge* or *jewel* is of gold, and oval; surrounding it is a wreath of shamrock proper on a gold field; within this is a band of sky-blue enamel charged with the motto of the order, Quis Separabit mdcclxxxiii. in gold letters; and within this band a saltire gules (the cross of St. Patrick), surmounted by a

shamrock or trefoil slipped vert, having on each of its leaves an imperial crown or. The field of the cross is either argent, or pierced and left open. A sky-blue *ribbon*, worn over the right shoulder, sustains the badge when the collar is not worn. The STAR, worn on the left side, differs from the badge only in being circular in place of oval, and in substituting for the exterior wreath of shamrocks eight rays of silver, four of which are larger than the other four. The MANTLE is of rich sky-blue tabinet, lined with white silk, and fastened by a cordon of blue silk and gold with tassels. On the right shoulder is the HOOD. The order is indicated by the initials K. P.

PATRICK, MARSENA R., b. N. Y., 1811 graduated at West Point in 1835 and received his commission in the 2d infantry; promoted to 1st lieut., 1839; capt., 1847; served in the Mexican war as commissary under Gen. Wool, and was brevetted maj. for his conduct there. In 1850 he laid down his commission and interested himself in practical farming and in the scientific and experimental teaching of agriculture. In 1861 he was made inspector-gen. of the N. Y. militia, rendered great service in organizing the troops, and in 1862 was made brig.gen. of volunteers, took part in the Shenandoah valley and Virginia campaign, and at Antietam commanded a brigade of the 1st corps. In 1862 he was appointed provost-martial-gen. of the Potomac army, held the position till the close of the war, and then held the same rank in the military department of Virginia. In 1865 he resigned; became president of the N. Y. state agricultural society; and from 1880 till his death in 1888 was governor of the National Soldiers' home, Dayton, O.

PATRICK, SIMON, D.D., 1626–1707; b. Gainsborough, Lincolnshire, Eng.; entered Queen's college, Cambridge, at the age of 18; and received a fellowship in 1648; took orders, and in 1658 was received as chaplain into the family of sir Walter St. John, of Battersea. In 1662 he was appointed rector of St. Paul's, Covent Garden, London, endearing himself to his people by his faithful instructions, and especially by his remaining with them during the plague of 1665. In 1666 he was made chaplain in ordinary to the king. In 1672 he was made prebendary of Westminster, and in 1679 dean of Peterborough. During the reign of James II. he defended Protestantism against the papists. He was appointed to preach before the prince and princess of Orange. In 1689 he was made bishop of Chichester, and in 1691 transferred to the see of Ely. In his early life, he wrote against the Non-conformists, in a pamphlet entitled *A Friendly Debate between a Conformist and a Non-conformist*, but after he became bishop he changed his opinion, regarded them with favor, and used his great influence to allay strife. He stood next to Tillotson in learning and influence. Of his numerous works were, *Mensa Mystica*, or *A Discourse concerning the Sacrament of the Lord's-Supper; The Heart's Ease, or a Remedy against all Troubles; Jewish Hypocrisy, a Caveat to the Present Generation; Sermons; Tracts against Popery; Paraphrases and Commentaries upon the Holy Scriptures.* The last are published usually with the commentaries of Louth, Arnald, Whitby, and Lowman, entitled *A Critical Commentary and Paraphrase on the Old and New Testament and the Apocrypha.* The historical and poetical books of the Old Testament are by Bishop Patrick. A complete edition of his works was published in 1858 by the Rev. Alexander Taylor, in 9 vols. His *Autobiography* was published at Oxford in 1839.

PATRIOTS' DAY, the anniversary in the state of Massachusetts of the momentous double battle of Concord and Lexington on April 19th, 1775, when the first American blood was shed in the cause of liberty. It was first observed April 19th, 1894.

PATRIPASSIANS (Lat. *pater*, father, and *passus*, suffered), the name of one of the earliest classes of anti-Trinitarian sectaries, who, in maintaining the oneness of the Godhead, held that all that is ascribed in the Scriptures, according to the Trinitarian exposition, to any of the Three Persons, is in reality true of the one Principal, whom alone these sectaries admitted, being in consequence called "Monarchians" (Gr. *monos*, one, and *archē*, principle). The leader of this sect was Praxeas, a native of Phrygia, who lived in the end of the 2d century. The name Patripassians, for which the Greek equivalent was *Patropaschites*, was in some sense a sobriquet, being founded on what their antagonists regarded as the absurd consequence derivable from their doctrine—viz., that as it was true to say that Jesus, in whom dwelt the Logos, or the Son, suffered, therefore it would be true on their principles to say that the Father suffered. The sect in this particular form was chiefly known in Rome; but their principals are in the main the same with those of the Sabellians. In Rome, Praxeas was succeeded by Noetus, but the party does not appear to have been numerous or influential.

PAT'ROCLUS. See ACHILLES.

PATROL is a detachment of 5 or 6 soldiers, fully armed, sent out, under a sergeant, from the mainguard or picket to traverse the streets of a garrisoned town, etc., and arrest disorderly persons or soldiers out of barrack without proper passes. Prisoners are taken to the guard-house, and brought before the town-major.

PATRON (Lat. *patronus*, from *pater*, father), among the Romans originally signified a citizen who had dependents, who were called *clients*, attached to him. Before the time of the Laws of the Twelve Tables, the most frequent use of the term *patronus* was in opposition to *libertus*, these two words being used to signify persons who stood to one another in the relation of master and manumitted slave. The Roman was not denuded of all right in his slave when he freed him; a tie remained somewhat like that of parent

and child, and the law recognized important obligations on the part of the *libertus* toward his patron, the neglect of which involved severe punishment. In some cases the patron could claim a right to the whole or part of the property of his freed man The original idea of a patron apart from the manumitter of slaves continued to exist. A Roman citizen, desirous of a protector, might attach himself to a patron, whose client he thenceforward became; and distinguished Romans were sometimes patrons of dependent states or cities, particularly where they had been the means of bringing them into subjection. Thus the Marcelli were patrons of the Sicilians, because Claudius Marcellus had conquered Syracuse and Sicily. The patron was the guardian of his client's interest, public and private; as his legal adviser, he vindicated his rights before the courts of law. The client was bound, on various occasions, to assist the patron with money, as by paying the costs of his suits, contributing to the marriage portions of his daughters, and defraying in part the expenses incurred in the discharge of public functions. Patron and client were under an obligation never to accuse one another; to violate this law amounted to the crime of treason, and any one was at liberty to slay the offender with impunity. One obvious effect of the institution of *clientela* was the introduction of an element of union between classes of citizens who were otherwise continually brought into opposition to each other. As the patron was in the habit of appearing in support of his clients in courts of justice, the word *patronus* acquired, in course of time, the signification of advocate or legal adviser and defender, the client being the party defended; hence the modern relation between counsel and client.—*Patron*, in after times, became a common designation of every protector or powerful promoter of the interests of another; and the saints, who were believed to watch over the interests of particular persons, places, trades, etc., acquired in the middle ages the designation of their patron saints. The saint in whose name a church is founded is considered its patron saint.

The term patron has also been applied to those who endowed or supported churches and convents. See PATRONAGE, ECCLESIASTICAL.

PAT'RONAGE, ECCLESIASTICAL, the right of presenting a fit person to a vacant ecclesiastical benefice. The patron, in the original and more strict sense, was the person who founded or endowed the church. In the early ages of Christianity the countries where the new religion had been adopted were parceled out into large districts or dioceses, under the superintendence of a bishop, who usually resided in the neighborhood of one of the religious houses. Within such district the bishop had the nomination of the priests, who supplied religious instruction to the people. The priests were paid out of the episcopal treasury, and traveled about in the exercise of their duties, having their residence with the bishop, and forming that *episcopi clerus* which constituted the notion of cathedral churches and monasteries in their simplest form. Occasionally a bishop endowed a church in his diocese and attached a priest permanently to it; and in Gaul, in the 5th c., a bishop who founded a church in a neighboring diocese was allowed to appoint an incumbent of his choice. As Christianity became more universal, and the population increased, the means of worship supplied by the bishoprics, the monasteries, and occasional episcopally endowed churches, became inadequate for the demands of the people, and the proprietors of lands began to build and endow churches in their own possessions. In such cases the chaplain or priest was not paid by the bishop, but allowed to receive for his maintenance, and for the use of his church, the whole or a part of the profits of the lands with which the founder had endowed it, and the offerings of those who frequented the church for worship. A district was defined by the founder, within which the functions of the officiating priest were to be exercised; and both the burden and the advantages of his ministry were limited to the inhabitants of that district. As these pious foundations tended both to the advancement of religion and to the relief of the episcopal treasury, they were encouraged by the bishops, who readily consecrated the churches thus established, and consented that the incumbent should be resident at the church, and receive the tithes and offerings of the inhabitants and what endowment the founder had annexed to the church. Eventually, it came also to be stipulated with the bishop that the founder and his heirs should have a share in the administration of the property, and have the right to nominate a person in holy orders to be the officiating minister whenever a vacancy occurred. It also became a not unusual arrangement that when owners of estates rebuilt such churches as were dependent on the cathedral, or undertook to pay the incumbent, to the relief of the cathedral, the right of presentation was transferred from the bishop to these persons, who thenceforward stood in the same relation to these churches as if they had been the original founders. Out of these private endowments arose the parochial divisions of a later time, which thus owe their origin rather to accidental and private dotation than to any legislative scheme for the ecclesiastical subdivision of the country. The bounds of a parish were at first generally commensurate with those of a manor, and the lord of the manor was the hereditary patron. The person enjoying the privileges of a founder was called *patronus* and *advocatus*. He had a pre-eminent seat and a burial-place in the church; he enjoyed a precedence among the clergy in processions; his name and arms were engraved on the church and on the church-bells, and he was specially named in the public prayers. He had the right to a certain portion of the church funds, called *patronagium*, and enjoyed the fruits of the benefice during a vacancy. In the course of time it sometimes happened that, with the concurrence of all parties

interested, the patronage, and the church with its revenues and appurtenances, were made over to a religious house, which thus became both patron and perpetual incumbent of the parish, while the immediate duties of the cure were devolved on a vicar or stipendiary curate. In France the right of patronage was often extended to churches not originally private foundations by the necessities of the sovereigns, which led them to take possession of church property, and bestow it in fee on laymen, who appropriated the greater part of the revenues, and took the appointment of the clergy into their own hands. For a length of time not merely the nomination but the investiture of the clergy came to be exercised by lay patrons, a state of matters which roused the indignation of successive popes and councils: until it was at last ruled by the third and fourth lateran councils (1179 and 1215 A.D.) that the presentation of the patron should not of itself suffice to confer any ecclesiastical benefice, even when qualified by the discretionary power of rejection given to the bishop, when the presentee was a layman. It was declared necessary that the presentee should not merely have the temporalities of the benefice conferred on him by induction, but also be invested with the spiritualities by institution. When the bishop was patron of the benefice the ceremonies of induction and institution were united in that of collation. With the growth of the papal power, however, a practice arose by which the right of presentation or induction, which had nominally been left to the patrons, became in some degree nugatory. Toward the close of the 12th c., letters of request, called mandates or expectatives, began to be issued by the popes to patrons, praying that benefices should be bestowed on particular persons. What had at first been requested as a favor was soon demanded as a right, and a code of rules was laid down with regard to grants and revocations of expectatives. In the 13th c. the patronage of all livings whose incumbents had died at the court of Rome (*vacantia in curiâ*) was claimed by the pope; and, as ecclesiastics of all ranks from every part of Europe frequently visited Rome, the number of benefices *vacantia in curiâ* was always very great. Clement V. went so far as broadly to declare that the pope possessed the full and free disposal of all ecclesiastical benefices. The practice next arose of the pope making reversionary grants, called provisions of benefices, during the lifetime of the incumbent, and reserving what benefices he thought fit for his private patronage. By means of permissions to hold benefices *in commendam*, and dispensations for non-residence and holding of pluralities, upwards of fifty benefices were often held by one person; and throughout all Europe the principal benefices were filled by Italian priests, nominees of the popes, who were often ignorant of the very language of the people among whom they ministered. In the 14th c. these claims encountered much opposition. England took the lead in an organized resistance, which was in the end successful. A series of English statutes was passed, beginning with the statute of provisors, 25 Edw. III. c. 6, solemnly vindicating the rights of ecclesiastical patronage, and subjecting to severe penalties (see PRÆMUNIRE) all persons who should attempt to enforce the authority of papal provisions in England. The principles adopted by the third and fourth Lateran councils have since been substantially the law of patronage in Roman Catholic countries. A lay patron is, by the canon law, bound to exercise his right of presentation within four, and an ecclesiastical patron within six months, failing which the right to present accrues *jure devoluto* to the bishop of the diocese. Patronage has always been more or less subject to alienation, transmission, and the changes incident to other kinds of property. The modern practice of patronage in the Roman Catholic church is detailed under the head provision (q.v.).

In England, where the modified canon law, which was in use before the reformation, is still in force, the rights of patrons do not materially differ from those which they possess in Roman Catholic countries. For some details regarding the right of presentation in England see ADVOWSON.

In Scotland, at the reformation, the rights of patrons were reserved, and presbyteries were bound by several statutes to admit any qualified person presented by the patron. The principle of these statutes was retained in the enactments introducing episcopacy. On the establishment of presbytery under favor of the civil war, patronage was abolished by act 1649, c. 23, and the election of the clergy was committed to the kirk-session. At the restoration this statute fell under the act rescissory, and patronage was replaced on its former footing. On the re-introduction of presbytery at the revolution patronage was again canceled, and the right to present conferred on the Protestant heritors and the elders of the parish, subject to the approval or rejection of the whole congregation. In consideration of being deprived of the right of presbytery at the revolution, patronage was the parish a compensation of 600 merks (£33 6*s*. sterling), on payment of which they were to execute a formal renunciation of their rights. Only three parishes effected this arrangement with the patron, and patronage was permanently restored in all the parishes where no renunciation had been granted by 10 Anne, c. 12. This act, with modifications introduced by 6 and 7 Vict. c. 61, was law till 1874. If a patron failed to present for six months after the occurrence of a vacancy, the right to present fell to the presbytery *jure devoluto*. The presentee, before he acquired a right to the emoluments of the benefice, required to be admitted to it by the presbytery of the bounds. He was first appointed to preach certain trial sermons, after which a day was fixed within six weeks for moderating in his call. On that day the people were invited to sign a written call to the presentee to be their minister, and however few the signatures to the call might be, the presbytery were in use to pronounce a formal judgment sustaining it. They then proceeded to

examine into the qualifications of the presentee, and, provided the result were satisfactory, the ordination followed (if he had not been previously ordained), and he was formally admitted minister of the parish by the presiding minister. Soon after the above-mentioned act of queen Anne, a feeling which had sprung up in favor of popular election, in opposition to patronage, led to various acts of resistance to the settlement of presentees, and brought about two considerable secessions from the church of Scotland. It continued for a length of time to be a subject of dispute how far the right of the church to judge of the fitness of presentees could entitle her to make rules tending to disqualify them, and in particular whether she could legally make the dissatisfaction of the congregation a disqualification. For a long time prior to 1834 there had been no attempt to give effect to any dissent on the part of the congregation. In that year the law of patronage again became a ground of contention, when a majority of the general assembly embodied their views on the subject in the so-called veto act, which declared that no minister was to be imposed on a congregation when a majority of heads of families and communicants should dissent from his admission. The decision of the court of session, confirmed by the house of lords, finding this act to be *ultra vires* of the general assembly, led to the secession of 1843 and formation of the *Free church* (q.v.). After that event an act, 6 and 7 Vict. c. 71, commonly called lord Aberdeen's act, was passed to fix by a legislative provision the effect which the church courts were in future to be entitled to give to the dissent of the congregation in the collation of ministers. It was there enacted that after the trial sermons, the presbytery should give to the parishioners, being members of the congregation, an opportunity to state objections which did not infer matter of charge to be proceeded against according to the discipline of the church. The presbytery were either to dispose of the objections, or to refer them to the superior church judicatory; and if they were considered well founded, the presbytery might reject the presentee. No power was given to reject him on the ground of mere dislike by any portion of the congregation. By an act of parliament in 1874 patronage was abolished, and the right of choosing their minister transferred to the congregation, provision being made to compensate the previous patron to the extent of one year's stipend of the parish.

In the Protestant churches of Germany, Sweden, and Denmark, patronage exists to some extent, subject to restrictions, which differ much in different localities. The right to present is sometimes divided between the patron and the consistory.

In the Greek church the right to present is generally in the hands of the bishops, excepting in Russia, where lay patronage exists to a limited extent.

PATRONOMATOLOGY is a dissertation treating of the origin of the names of men, showing their relations to the arts or professions, their illustration of some quality or characteristic, or any other fact or circumstance from which they may have originated.

PA'TRONS OF HUSBANDRY. See GRANGE.

PATRON SAINTS OF COUNTRIES, CITIES, AND TOWNS:

Asturia, St. Ephrem.
Austria, SS. Colman and Leopold.
Bavaria, SS. George, Mary, and Wolfgang.
Bohemia, SS. Norbert, Wenceslaus, John Nepomuc, Adalbert, Cosmas, Damian, Cyril, and Methodius.
Brabant, SS. Peter, Philip, and Andrew.
Brandenburg St. John Baptist.
Brunswick, St. Andrew.
Burgundy, SS. Andrew and Mary.
Denmark, SS. Anscharius and Canute.
England, SS. George and Mary.
Flanders, St. Peter.
France, SS. Mary, Michael, and Denis.
Germany, SS. Martin, Boniface, and George.
Hanover, St. Mary.
Holland, St. Mary.
Holstein, St. Andrew.
Hungary, SS. Mary and Louis.
Ireland, St. Patrick.
Italy, St. Anthony.
Luxemburg, SS. Peter, Philip, and Andrew.
Mecklenburg, St. John the Evangelist.
Naples, St. Januarius.
Navarre, SS. Fermin and Xavier.
Norway, SS. Anscharius and Olaus.
Oldenburg, St. Mary.
Parma, SS. Hilary, John Baptist, Thomas, and Vitalis.
Poland, SS. Stanislaus and Hederiga.
Pomerania, SS. Mary and Otho.
Portugal, SS. Sebastian, James, and George.
Prussia, SS. Mary, Adalbert, and Andrew.

Russia, SS. Nicholas, Andrew, Wladimir, and Mary.
Sardinia, St. Mary.
Scotland, St. Andrew.
Sicily, SS Mary, Vitus, Rosalie, and George.
Spain, SS. James the Great, Michael, Thomas à Becket, and Edward
Suabia, St. George.
Sweden, SS. Bridget, Eric, Anscharius, and John.
Switzerland, SS. Martin, Gall, and Mary.
Venice, SS. Mark, Justina, and Theodore.
Wales, St. David.

PATROON. In the early settlement of America, the Dutch West India Company found it expedient, in order to facilitate emigration, to authorize its members in New York to take possession of land on the banks of the streams, with the proviso that, within a limited time, fifty settlers should be introduced for every mile of land occupied. The person so pledging himself received the title and privileges of a lord patroon or protector, and his colony or manor was governed by the same laws as were the feudal colonies of the United Provinces. After the revolution a very large proportion of the land of New York was occupied by these patroons, who were the landlords; and the farmers or cultivators held their leases for one or more lives, or from year to year, their rents, dues, and services being provided for, according to feudal tenures of England and Holland. In 1779 and 1785 laws were passed by the state abolishing the claims of the patroons, but the proprietors or patroons of the manor grants refused to give them up entirely, arranging with the cultivators to pay their rents, dues, and perform services in exactly the same manner as before. The countries of Albany, Rensselaer, Columbia, Greene, Ulster, Delaware, Schoharie, Montgomery, Herkimer, Otsego, and Oneida are those in which most of these grants were found. But the above arrangements not proving satisfactory to the tenants, the turbulent spirits among them formed associations to devise means for ridding themselves of these burdens, which were called anti-rent associations. The feeling exhibited itself very strongly by resistance to the collection of the rent by the patroons, even though that rent might be merely nominal. The anti-rent associations finally concluded to form a political party of their own, whose policy should be to elect all town and county officers from their own ranks, and to vote for no state, civil, judicial, or executive officers unfriendly to them. This had some influence, and Gov. Wright was defeated by 10,000 majority for John Young, their candidate. Under him the excitement died out, in 1847, and the party was merged into others. See ANTI-RENTERS. VAN RENSSELAER, STEPHEN.

PATRONYM'IC (Gr. *pater*, father, and *onoma*, name), properly a name taken from one's father, but generally applied to such names as express descent from a parent or ancestor. In Sanskrit, Greek, and Latin, patronymics are very numerous. They may be derived from the name of a father, mother, grandfather, or remoter ancestor, as Atrides, i.e., (Agamemnon), son of Atreus; Philyrides, i.e., (Chiron), son of Philyra; Æacides, i.e., (Achilles), grandson of Æacus. The names of the founders of nations have also been used to form a sort of patronymic, as when the Romans are called Romulidæ. In Greek and Latin the commonest terminations of patronymics are *ides* and *is*. Patronymics have no fewer than thirteen recognized terminations in Sanskrit. A number of the surnames in use in modern times are patronymics, as Johnson, the son of John; Thomson, the son of Thomas. Originally these names fluctuated from generation to generation, as still is, or very recently was, the case in Shetland, where Magnus Johnson's son calls himself John Magnusson or Manson. In the course of time, it was generally found more convenient to take a surname from one well-known ancestor, which should descend unchanged to the children of the bearer of it. The termination *s* is sometimes used as equivalent to son, as in Jones, Rodgers. To patronymics belong Norman, Highland, Irish, and Welsh surnames with the prefixes of *Fitz*, *Mac*, *O*, and *Ap*, respectively. In many cases the *Mac* of the Highlands of Scotland ceased to have a fluctuating character only a few generations ago. In 1465 an act of the parliament of Ireland was directed against the use of patronymics. Every Irishman "dwelling betwixt or among Englishmen in the counties of Dublin, Myeth, Uriel, or Kildare," was ordered "to take to him an English surname of a town, as Sutton, Chester, Trym, Skryne, Corke, Kinsale; or color, as White, Blacke; or arte or science, as Smith or Carpenter; or office, as Cooke or Butler; and that he and his issue should use the same." In Wales it was long the practice to use a string of ancestral names, each with the syllable *Ap* prefixed to it. Camden relates that "in the time of king Henry VIII. an ancient worshipful gentleman of Wales being called at the pannell of a jury by the name of Thomas Ap William Ap Thomas Ap Richard Ap Hoel Ap Evan Vaghan, etc., was advised by the judge to leave that old manner; whereupon he afterwards called himself Moston, according to the name of his principal house, and left that surname to his posteritie." See NAME.

PATTÉE, CROSS, in heraldry (Lat. *patulus*, spreading), also called cross formée, a cross with its arms expanding towards the ends, and flat at their outer edges.

PATTEN, SIMON NELSON, b. at Sandwich, Ill., May 1, 1852. He studied at the Northwestern university (Ill.), and at the university of Halle (Germany), receiving the degree

of Ph.D. in 1878. Ten years later he became professor of political economy in the university of Pennsylvania. Among his works are *The Stability of Prices* (1888), *The Consumption of Wealth* (1889), *The Economic Basis of Protection* (1890), *Principles of Rational Taxation* (1890), *The Educational Value of Political Economy* (1891), and *The Theory of Dynamic Economics* (1892). He has also contributed many valuable papers and essays to various economic periodicals.

PATTERSON, CARLILE POLLOCK, b. Miss., 1816; appointed midshipman 1830. He afterwards graduated at Georgetown college as a civil engineer, and was attached to the coast survey, 1838–41. He was 2d lieutenant of the U. S. ship *Boxer* till 1845, when he re-entered the coast survey, and led a hydrographic expedition to the gulf of Mexico. In 1861 he was appointed hydrographic inspector in the U. S. coast survey, of which he was appointed superintendent in 1874. He d. 1881.

PATTERSON, DANIEL TOD, 1786–1839; b. Long Island, N. Y.; entered the navy in 1800. He was on board the frigate *Philadelphia* in the expedition commanded by Capt. William Bainbridge, engaged in the blockade of Tripoli, Oct. 31, 1803, when the frigate ran upon the rocks and the vessel and entire crew were captured, all on board being held as prisoners in Tripoli for 13 months, or until peace was declared. On Jan. 24, 1807, he was promoted to the rank of lieutenant, and on July 24, 1813, to master-commander. He co-operated with Gen. Andrew Jackson in 1814–15 in the defense of New Orleans, commanding the naval forces, and lending such support as to assure the victory over the British, and elicit an expression of appreciation from congress. He commanded the expedition to capture the defenses of the corsair Lafitte on the island of Grand Terre in Barataria bay, took the settlement and all its vessels in port at the time, but failed to seize the pirate and his comrades. He was made captain Feb. 28, 1815; commanded the frigate *Constitution*, 1826–28; and was appointed navy-commissioner in the latter year, holding the position 4 years. In 1832–36 he was sent to the Mediterranean in command of a squadron, and on his return accepted the position of commandant at the navy-yard at Washington, which he held at his death.

PATTERSON (BONAPARTE), ELIZABETH, 1785–1879; b. Baltimore, Md.; educated chiefly by her mother, and noted for her remarkable beauty. Dec. 24, 1803, Jérôme Bonaparte, brother of Napoleon I., who was visiting the United States, married her after much resistance on the part of her family, the ceremony being performed by the Roman Catholic bishop of Baltimore. This marriage greatly incensed Napoleon, then first consul of France, who ordered his brother, who was in the French naval service, to return immediately to France, while prohibiting all French captains from receiving the wife of Lieut. Bonaparte on board their vessels, and refusing to give her an asylum in France. The French senate, by special act, refused to recognize the ceremony of marriage in this instance as valid, on the ground that it was without consent of the mother of Jérôme, and without previous publication in France. On the accession of Napoleon to the imperial throne, Jérôme was excluded from the dynasty in company with his brother Lucien, who had also made a marriage obnoxious to the emperor. The latter offered to make an allowance of 60,000 francs per year to Jérôme's bride if she would surrender the name of her husband. But this offer was rejected. Jérôme and his wife proceeded to Europe in 1804, but on reaching Lisbon, only the former was permitted to land, and his wife sailed for Amsterdam. No efforts could induce Napoleon to reconsider his determination, and in the end he even induced or forced his brother to contract another matrimonial alliance. Jérôme was married on Aug. 12, 1807, to the princess Frederika Catharina, daughter of the king of Würtemberg. In 1815 Mme. Bonaparte was divorced from her husband by a special act of the legislature of Maryland. She again visited Europe, where she achieved a profound impression by her beauty and intellectual gifts. She lived abroad for many years, only occasionally returning to her native land for a brief visit. By Jérôme she had one son, Jérôme Napoleon Bonaparte, who was eventually recognized by Napoleon III. as being legitimately a member of the family, and who was established in his rights as of French birth by a decree dated Aug. 30, 1854, though he was denied all right of succession. The last 18 years of Mme. Bonaparte's life were passed in Baltimore in obscurity, in a quiet boarding-house. See BONAPARTE, JÉROME.

PATTERSON, JOHN, 1744–1808; b. Conn,; educated at Yale, and admitted to the bar. He settled in Lenox, Mass., in 1774, and was elected a member of the Massachusetts provincial congress. The day after the news of the battle of Lexington reached Lenox, Patterson set out for Cambridge with a regiment of minute-men. They arrived in time to work upon the first redoubt along the lines around Boston. Patterson afterwards went to Canada, and took part in the battle of the Cedars. His regiment then went to New Jersey, and was in the battles of Trenton and Princeton. He was appointed a brigadier-general in Feb., 1777; led his brigade at Stillwater; and continued in the service through the war, witnessing the surrender of Burgoyne and the battle of Monmouth. He held a command in the Massachusetts militia during Shays's rebellion in 1786. He afterwards settled in Lisle, New York, and became county judge of Broome county. He served 4 terms in the state legislature, was a member of the state constitutional convention of 1801, and of congress, 1803–5.

PATTERSON, ROBERT, LL.D., 1743–1824; b. Ireland; emigrated to Philadelphia in 1768; was principal of an academy in Wilmington, Del., 1774; was assistant surgeon and brigade-major in the revolutionary war in 1776–78. In 1779–1814 he was professor

PATTERSON, ROBERT, LL.D., 1743–1824; b. Ireland; emigrated to Philadelphia in 1768; was principal of an academy in Wilmington, Del., in 1774; was assistant surgeon and brigade major in the revolutionary war in 1776–78. In 1779–1814 he was professor of mathematics in the university of Pennsylvania, and vice-provost; in 1805–24 was director of the U. S. mint; was chosen in 1819 president of the American peace society, and later, president of the American philosophical society. He is the author of *The Newtonian System;* an *Arithmetic;* and contributed many papers to the *Transactions* of the American philosophical society. He also edited Ferguson's lectures on *Mechanics,* his *Astronomy,* and Webster's and Ewing's *Natural Philosophy.* He was an elder in the Scotch Presbyterian church nearly half a century.

PATTERSON, ROBERT, 1753–1827; b. Penn.; in 1775 emigrated to Kentucky and became noted as a frontiersman and Indian fighter. He was concerned in Col. Clarke's expeditions against the Indians from 1778 to 1781, and in Bowman's attack on Chillicothe (1779). He also took part in the battle of Lower Blue Lick under Daniel Boone. He was the original owner of a large part of the land now occupied by the city of Cincinnati, Ohio.

PATTERSON, ROBERT, b. Ireland, 1792; came to this country while very young, and was employed in the counting-room of a merchant in Philadelphia. Subsequently he received a collegiate education and decided to enter the army. He was commissioned 1st lieutenant 22d infantry, 1813; in 1814 was made captain 32d infantry. After the war he turned his attention to manufactures, owning a number of factories, and when the Mexican war broke out resumed his sword and was appointed major-general U. S. volunteers, July 7, 1846, and participated in the battle of Cerro Gordo, April 18, 1847, under Gen. Winfield Scott, leading the cavalry charge and keeping his position in the front during the flight of the defeated Mexicans. In the war of the rebellion he entered the volunteer army as maj.gen. of Pennsylvania volunteers at the first call April 15, 1861, for 75,000, 3-months men, and was assigned to the command of the department which included the states of Pennsylvania, Delaware, Maryland, and the district of Columbia. He was mustered out of the service at the expiration of his commission, July 27, 1861, and afterward lived in Philadelphia, engaged in manufacturing. In 1865 he published a *Narrative of the Campaign in the Valley of the Shenandoah in* 1861, a vindication of the course pursued by him while in command at Winchester, prior to the unfortunate battle of Bull Run. He d. 1881.

PATTERSON, WILLIAM, LL.D., 1744–1806; b. at sea, his parents being Irish emigrants; educated at the college of New Jersey, where he graduated in 1763; afterwards studied law and was admitted to practice in 1769. He was a member of the New Jersey constitutional convention of 1776, and for the next ten years was state attorney-general. He was a member of the constitutional convention of 1789, and the same year was elected U. S. senator. In 1794 he was appointed judge of the U. S. supreme court and held that position until his death. In 1799 he published a revision of the laws of N. J. under the authority of the legislature.

PATTESON, JOHN COLERIDGE, D.D., 1827–71; b. at London; a relative of the celebrated Samuel Taylor Coleridge; and his father judge Patteson was an eminent lawyer. He was educated at Merton College, Oxford, became a fellow in 1852; was ordained in 1853 and made curate of Alfington; went in 1854 with Bishop Selwyn to New Zealand, where he assisted the bishop in a missionary college, and labored as a missionary until 1861, when he was made bishop of the Melanesian islands. He learned the languages of the islands with great facility, reduced the different dialects to writing, obtained a printing-press and types, and printed the grammars of nearly 30 of them. He translated hymns and portions of the Scriptures. He was a man of uncommon versatility, applying his mind or hands to whatever function high or humble, in which he might benefit the people. He made frequent excursions to the different islands, which were attended with great peril, either from shipwreck or from the hostility of the natives. In April, 1871, he set out on a voyage of visitation, and in September found himself off the Santa Cruz group where he had long desired to preach the Gospel. The natives had become distrustful of the whites, as many of their number had been captured by traders from Australia; and the traders having painted their ship like the bishops, the danger was greatly increased. The bishop landed on the beach, but was slain by the savages. His life has been written by Miss C. M. Yonge (2 vols., 1874), and also by Francis Awdry, *The Story of a Fellow-Soldier* (1875).

PATTI, ADELINA MARIA CLORINDA, a popular operatic singer of Italian extraction, b. at Madrid, Feb. 19, 1843. After a course of professional study, she sang at an early age in New York. Her *début* in London took place in 1861 as Amina in *La Sonnambula;* and she has ever since been looked upon as one of the first singers of the day. Her voice is an unusually high soprano, of rich, bell-like quality, and remarkable evenness of tone; to these qualities she adds purity of style and high artistic finish Equally at home in the tenderness of deep passion and the sprightly vivacity of light comedy, she has also sung with success in oratorio. She has also won golden opinions on the continent, wherever she has appeared, receiving, in 1870, the order of merit from the emperor of Russia. Her greatest success is generally considered to be in the part of Marguerite in Gounod's *Faust.* In May, 1868, she married the marquis de Caux, from whom she was divorced in 1885, and married Ernesto Nicolini in 1886.

PATTI (MUNCK), CARLOTTA, sister of ADELINA, b. 1840, a leading singer of her time, though a slight degree of lameness prevented her from appearing much in opera. Her voice was a soprano of unusual compass, and of a clear silvery quality, and much power in the upper register. Her peculiarly high notes, and a graceful *abandon* of manner, brought her into favor with the public, though in quality of tone she did not equal her sister. She made her *début* in London in 1863, but had for some time before been in the enjoyment of a high reputation in the United States. She d. 1889.

PATTISON, DOROTHY WYNDLOW (SISTER DORA), 1832–78; b. England; daughter of Rev. Mark James Pattison, rector of Hauxwell. In 1864 she joined a sisterhood of the Anglican church, and as "Sister Dora" served as nurse in the cottage hospital at North Ormesby, and afterwards in that at Walsall, Staffordshire, finally taking sole charge of the institution. Her wonderful courage, zeal, ability, and success are well described in *Sister Dora; a Biography*, by Margaret Lonsdale.

PATTISON, MARK, 1813–84; b. Yorkshire, England; graduated, 1836, at Oriel college, and was elected fellow of Lincoln college, 1840. In 1861 he became director of that college. During the latter part of his life he gave much of his time to writing upon literary and philosophical subjects. In 1860 he published *Tendencies of Religious Thought in England (1688–1750)*; *Life of Isaac Casaubon* (1875); *Life of Milton* (1880); *Milton's Sonnets, with Notes* (1882).

PATTISON, ROBERT EMORY, b. near Snow Hill, Somerset co., Md. 1850; son of Robert H. Pattison, a popular Methodist minister. He was educated in the public schools of Philadelphia, and admitted to the bar of that city, 1872. In 1877 he was elected city controller, and proved so efficient and courageous in his resistance of corrupt municipal combinations, that he easily secured a re-election in 1881. He was elected gov. of Penn. in 1882 and 1890.

PATTISON, ROBERT EVERETT, D.D., 1800–74; b. Vt.; graduated at Amherst college, 1830; was tutor in Columbian univ., Washington, D. C.; ordained as a Baptist minister at Salem, Mass., 1829; and settled, in 1830, pastor of the First Baptist church in Providence, R. I. In 1836 he was elected president of Waterville college, Maine, retaining the position until 1840, when he returned to his former pastorate in Providence. In 1846 he became professor in the theological seminary at Covington, Ky. In 1848 he was elected professor of theology in the Newton theological institution, Massachusetts, and in 1853 was again president of Waterville college. Subsequently he held other collegiate positions. He was the author of *Commentary on the Epistle to the Ephesians* (Boston, 1859).

PATTON, FRANCIS LANDEY, D.D., LL.D.; b. Warwick, Bermuda, 1843. His family removed to Toronto, Canada. He was educated at University and Knox colleges, Toronto; graduated at Princeton, N. J., theolog. seminary, 1865; was pastor of Presbyterian churches in New York, Nyack, and Brooklyn, 1865–71; prof. didactic and polemical theology in Pres. theolog. seminary, Chicago, 1871–81; editor of *The Interior*, 1873–76; pastor Jefferson Park Pres. church, 1874–81; and active in prosecuting Prof. Swing for heresy; in 1878 moderator of Pres. general assembly; in 1881 became Stuart prof. in Princeton, N. J., theolog. seminary, and prof. of ethics in Princeton coll., of which he was elected president, 1888. He is an editor of *The Princeton Review*, and has published *Inspiration of the Scriptures* (1869); *Summary of Christian Doctrine* (1874).

PATUXENT, a river of Maryland, rises 18 m. e. of Frederick, and, after a southeasterly course of 90 m., empties by a broad estuary into Chesapeake bay; navigable for small vessels for 50 miles.

PAU, a flourishing t. of France, capital of the department of Basses-Pyrénées, on the right bank of the Gave-de-Pau, 105 m. s.s.e. of Bordeaux. It occupies a rocky height, cloven into two portions by a ravine through which a streamlet flows into the Gave-de-Pau, and united by a high bridge. Toward the s. it commands most magnificent views of the western Pyrenees; indeed, for mountain views its situation is hardly surpassed by that of any town in France. As seen from this town, the distant Pyrenees rise in peaks, cones, and serrated ridges, and present an outline as varied as it is strikingly beautiful. The town contains a palace of justice, a promenade, royal square, with a bronze statue of Henri IV., beautiful theater, university-academy, museum, and library of 25,000 vols. Linen and cloth manufactures are the chief branches of industry; in the vicinity Jurançon wine (good but strong) is grown. Many swine are fed in the vicinity, and from the pork the famous *Jambons de Bayonne* are made. Pau is a favorite resort of the English, especially during winter, and is a general rendezvous for those who wish to explore the Pyrenees. Pop. '96, 33,012.

PAUCHONTI TREE, *Isonandra polyandra*, a large forest-tree, of the same genus with the gutta-percha tree, and producing a substance similar to gutta-percha, abundant in some of the forests at the base of the western Ghauts in India.

PAUL, the great apostle of the Gentiles, was born of Jewish parents at Tarsus, in Cilicia, and inherited from them the rights of Roman citizenship. His original name was Saul. He was educated first in his native city, then in the zenith of its reputation for its schools of literature and philosophy, where he doubtless learned to speak and write Greek; and afterwards, to be perfected "in the law of his fathers," was sent to Jerusalem, where he studied under Gamaliel, a great Jewish doctor, and became one of

the strictest, most zealous, and most ardent Pharisees. Whether it was here or at Tarsus that he acquired his knowledge—which we have no reason to believe was ever very deep—of the philosophy and literature of Greece, cannot be ascertained. According to the wholesome rule observed among the Jews, that every person should learn some trade, Saul became a tent-maker, and at this trade he afterwards labored (Acts xviii. 3) for his support. A few years after the death of Jesus, he became, as might have been expected from his training and temperament, a furious adversary of the new sect of Christians. We are told (Acts vi. 9) that the Jews of the Cilician synagogue at Jerusalem were among those who disputed with Stephen, and it is natural to suppose that the young and brilliant zealot, eager for disputation, was conspicuous among the crowd of Jewish students who poured out of their synagogues (of which, according to the Talmud, there were 480 in the holy city), in the insolence of their youth and scholarship, to crush the ignorant followers of the Nazarene. This supposition is rendered highly probable by the fact that he was present at the martyrdom of Stephen, which followed almost immediately, having charge of the raiment of them that slew him. He now became a prominent actor in the great persecution of the Christians that broke out at Jerusalem. The mysterious circumstances that led to and attended his conversion are familiar to all readers of the Acts of the Apostles, and need not be recapitulated here. After a solitary sojourn in Arabia—perhaps to calm his perturbed spirit in communion with God, and to solemnly prepare himself for his new mode of life—on his return to Damascus, he changed his name to Paul, and resumed or began (it is not quite clear which) his apostolic labors. Naturally he became an object of intense hostility to the unbelieving Jews in that city. They resolved to kill him; but his friends contrived a way of escape, and he fled to Jerusalem, where at first he was received with suspicion by the disciples, but afterwards, through the kind offices of Barnabas, with great cordiality. He now "spoke boldly in the name of Christ," disputing also against the "Grecians"—i.e., the Hellenistic Jews—with dangerous success, for his opponents sought to take his life. Again he was obliged to flee, and betook himself to his birthplace, Tarsus, where he seems to have remained till Barnabas brought him to Antioch (not far off), to assist in the great work of evangelization going on in that city. After a short visit to Jerusalem in the year of the famine, 44 A.D., they were set apart by the prophets and elders of the church at Antioch for the evangelization of the more distant Jews. From Seleucia they proceeded on their first missionary expedition to the southern districts of Asia Minor, Pamphylia, Pisidia, and Lycaonia, where they met, especially in some places, with considerable success, in preaching the gospel. It is very interesting to notice how gradually the light of Christianity dawned on the mind of the apostle. He did not grasp all at once its grand design. It was not even by abstract reflection that he arrived at it. Circumstances of quite an outward sort forced him to the sublime conclusions of his creed. It was when the Jews of Pisidian Antioch, enraged at his preaching the gospel indiscriminately to their Gentile fellow-townsmen and themselves, "contradicted and blasphemed" him, that he boldly announced Christ as the universal Redeemer. After the return of Paul and Barnabas to Antioch, they continued to labor in that city for a long time, till dissensions having arisen about the circumcision of Gentile converts, he, along with Barnabas and others, was chosen to go up to Jerusalem, to get the opinion of the apostles and elders there on the question, about 51 A.D. Paul and Barnabas now returned to Antioch, where they continued to teach and preach, till a yearning grew up in the heart of the former to revisit his Gentile converts in Asia Minor. In his second expedition, Paul was accompanied by Silas instead of Barnabas, and traversed the whole of Asia Minor from south to north, evangelizing with great success, after which the two missionaries crossed the Ægean and landed in Europe, planting at Philippi, the capital of Thracian Macedonia, the first Christian church in that continent. The details of his visits to Thessalonica, Berea, Athens, and Corinth are, doubtless, familiar to our readers, and need not be given here. We can only notice his appearance at Athens, where, on Mars's hill, before a crowd of the citizens, among whom were Epicurean and Stoic philosophers, he delivered that magnificent discourse in which he declared to the Athenians the character of the "unknown" God. On his return to Asia Minor he visited Ephesus, where, as usual, he "reasoned" with the Jews in their synagogue; sailed thence to Cæsarea, in Palestine, and proceeded to Jerusalem "to keep the feast;" after which he again returned to Antioch, the center from which his operations radiated. Thus closed his *second* evangelistic journey. The third journey of Paul commenced probably about 54 A.D., and extended over much the same district as the previous one. At Ephesus, where he remained for a period of two years and three months, his efforts were powerfully seconded by the eloquence of the great Alexandrian convert, Apollos. Here it is recorded (Acts xix.) that "God wrought special miracles by the hand of Paul, so that from his body were brought unto the sick handkerchiefs or aprons, and the diseases departed from them, and the evil spirits went out of them." In explanation of this very curious procedure, which has a disagreeable resemblance to ordinary legerdemain, it has been suggested, that as Ephesus was a city noted for its exorcisms, spells, and incantations—the famous *Ephesia Grammata* sold at a high price to the ignorant and superstitious populace—this style of miracle was an accommodation to their belief in magic and demonism, and intended to show them, according to their own way of regarding things, the superiority of Christ's power to that of the evil spirits of heathen worship.

From Ephesus Paul went up to Jerusalem with a presentiment that heavy evils were about to fall upon him through the ever-maddening malice of the Jews. The Jewish populace were goaded into the wildest fury by the very sight of Paul. The capt. of the Roman guard, Claudius Lysias, had to interfere to save him from being torn to pieces; but as 40 Pharisees had sworn neither to eat nor drink till they had taken his life, he was sent by night, under a strong escort, to the Roman governor Felix, at Cæsarea, where he was unjustly detained a prisoner for two years. Having finally appealed to the Roman emperor, according to the privilege of a Roman citizen, he was sent to Rome. On the voyage thither he suffered shipwreck at Melita (probably Malta), in the spring of 61 A.D. At Rome he was treated with respect, being allowed to dwell "for two whole years in his own hired house." His first thoughts were, as usual, directed towards his Jewish brethren in the city; but, on the whole, he made little impression on them. Whether he ever left the city or not cannot be positively demonstrated, but it is believed by many critics, from a variety of considerations, that he did obtain his liberty about 64 A.D., and that he made journeys both to the e. and to the w., revisiting Asia Minor, and carrying out his long-cherished wish of preaching the gospel in Spain. Meanwhile occured the mysterious burning of Rome, generally attributed to Nero, who threw the blame on the Christians, and in consequence subjected them to a severe persecution. Among the victims was Paul, who, according to tradition, suffered, 67 A.D.—See *Life and Epistles of St. Paul*, by Conybeare and Howson; Baur's *Paulus;* Lipsius, *Der Apostel Paulus* (1869); Renan, *Saint Paul* (1869); Pfleiderer, *Der Paulinismus* (1873; transl. 1878); Farrar's *St. Paul*, 1879.

PAUL, the name of five popes, of whom the following appear to call for special notice. —PAUL III., whose pontificate falls upon one of the most critical periods in the history of the church, was originally named Alessandro Farnese, and was born at Carino, in Tuscany, in 1468. Having been created cardinal he served in several important trusts, and eventually became bishop of Ostia and dean of the Sacred college. On the death of Clement VII. in 1534, he was elected pope, just at the crisis when the world was alive with expectation of the general council which was to decide all the controversies at that time agitating the public mind of Europe. After some delays Paul convoked the council to meet at Mantua in 1542; but it did not actually assemble (in Trent) until 1545. These delays are by some charged upon Paul; but it can hardly be doubted that much of it was due to the difficulties of the times. The bull of excommunication and deposition which he issued in 1538 against Henry VIII. of England is one of the last examples of the exercise of the temporal power claimed by the mediæval popes. In the contest of Charles V. with the Protestant league in Germany, Paul sent a large force to support him, and he opposed the pacification proposed by the emperor upon the basis of the interim (q.v.). Paul's conduct in aggrandizing the fortune of his son, Pietro Luigi Farnese, has been severely criticised by historians; the more so, that this son was born out of wedlock, in the early youth of his father. Paul died, Nov. 10, 1549, in his 82d year.—PAUL IV., named John Peter Caraffa, a member of the noble family of that name, was born in Naples in 1476. His early career was distinguished for ascetic rigor. He was appointed bishop of Chieti, in which see he labored most earnestly for the reformation of abuses, and for the revival of religion and morality. With this view he established, in conjunction with several congenial reformers, the congregation of secular clergy called theatines (q.v.), and was himself the first superior. It was under his influence that Paul III. organized the tribunal of the inquisition in Rome. On the death of Marcellus II. in 1555, although in his 79th year, he was elected to succeed. He entered upon the wider career of reformation which his new position opened for him with all the ardor of a young man, and with all the stern enthusiasm which had characterized him during life. He enforced vigorously upon the clergy the observance of all the clerical duties, and enacted laws for the maintenance of public morality. He established a censorship, and completed the organization of the Roman inquisition; he took measures for the alleviation of the burdens of the poorer classes, and for the better administration of justice, not sparing even his own nephews, whom he banished from Rome on account of their corrupt conduct and profligate life. His foreign relations, too, involved him in much labor and perplexity. He was embroiled with the emperor Ferdinand, with Philip II. of Spain, with Cosmo, grand duke of Tuscany. Having condemned the principles of the peace of Augsburg, he protested against its provisions. Under the weight of so many cares, his great age gave way. He died, Aug. 18, 1559, in his 84th year. At his death the populace broke out into an insurrectionary tumult, which lasted till the conclave for the appointment of his successor.—PAUL V., originally named Camillo Borghese, was born in Rome in 1552. In his early life he was a distinguished canonist and theologian; and after the ordinary prelatical career at Rome he rose first to the post of nuncio at the Spanish court, and afterwards to the cardinalate under Clement VIII. On the death of Leo XI., in 1605, cardinal Borghese was elected to succeed him. His pontificate is rendered memorable by the celebrated conflict with the republic of Venice, into which he was plunged at the very outset of his career. The original ground of dispute was the question of the immunity from the jurisdiction of civil tribunals conceded to the clergy, who claimed to be tried by ecclesiastical tribunals alone. This claim the senate resisted; and further causes of dispute were added by a mortmain law, and a law prohibiting the estab-

lishment of new religious orders or associations unless with the sanction of the senate. Each party remaining inflexible in its determination, Paul issued a brief, directing a sentence of excommunication against the doge and senate, and placing the republic under an interdict unless submission should be made within twenty-four days. The senate persisted, and an animated conflict, as well of acts as of writings, ensued, in the latter of which the celebrated Fra Paolo Sarpi, on the side of the republic, and on the papal side, Bellarmino and Baronius, were the leaders. Preparations were even made for actual hostilities; but, by the intervention of Henry IV. of France, the dispute was accommodated and peace restored in 1607, although dissatisfaction afterwards arose on the subject of the nomination of a patriarch. Paul, whose administration was a vigorous and noble one, died Jan. 28th, 1621.

PAUL, Hermann, philologist, was born in Magdeburg in 1846; studied at Berlin and Leipzig, and in 1874 became Professor in the University of Freiburg. His publications comprise *Gab es eine mittelhochdeutsche Schriftsprache?* (1873); *Zur Lautverschiebung* (1874); *Kritische Beiträge zu den Minnesingern* (1876); *Zur Nibelungenfrage* (1877); *Mittelhochdeutsche Grammatik* (1884). He is best known in the United States by his *Prinzipien der Sprachgeschichte*, (1880; second ed., 1886), which has been translated into English by Prof. Strong (1888), and retranslated with changes by Professors Strong, Logeman, and Wheeler (1891).

PAUL (Petrowitsch), Emperor of Russia, the second son of the unfortunate Peter III. and the empress Catherine II., was b. in 1754, became heir-apparent on the death of his elder brother in 1763, and succeeded his mother on the imperial throne in 1796. The tragical death of his father when he was still a child, and the neglect and want of confidence with which his mother treated him, exerted a baneful influence on the character of Paul, who was kept in compulsory seclusion while Catharine shared the administration of the government with her favorites. In 1776 Paul, on the death of his first wife, a princess of Hesse-Darmstadt, married the princess Dorothea of Würtemberg, by whom he had four sons—the late emperors Alexander and Nicholas, and the grand dukes Constantine and Michael, and several daughters. After spending some years in traveling with his wife through Germany, France, and Italy, Paul was recalled by his mother, who assigned to him the palace of Gatchina, 30 m. from St. Petersburg, as his settled residence, while she took his children under her own immediate care. The death of the empress in 1796 released him from his unnatural restraint, and he ascended the throne with no practical acquaintance with the mechanism of government, and no knowledge of the people whom he was called to rule over. A determination to change everything that had existed under the previous reign, and to wreak vengeance on the murderers of his father, were the predominating influences that guided his actions; and his earliest measures, which were the disgrace of his father's murderers, and the pardon of all Polish prisoners, gave hopes of a good reign; but the capricious violence of character and incapacity for business which Paul betrayed, soon disappointed the hopes that he had awakened. No department of the state was free from his frivolous interference, and no class of the nation exempt from the effect of his arbitrary legislation. While he irritated the soldiery by vexatious regulations in regard to their dress, he offended the nobles by imperious enactments as to the ceremonials to be observed in his presence. His foreign policy was marked with similar caprice. After having adopted a system of neutrality in the war between France and the rest of Europe, he suddenly declared in favor of the allied powers, and sent an army of 56,000 men under Suwaroff into Italy. The success of his general encouraged him to send a second army of equal strength to co-operate with the Austrians; but their defeat in 1799 induced Paul to recall Suwaroff with the Russian troops; and having retired from the allied coalition without having given any reason for his conduct, he quarreled with England, because she would not comply with his whimsical demand for the surrender of Malta, and his own recognition as grand master of the order of Malta, and entered into a close alliance with Bonaparte, who was then first consul. The jealousy and hatred of England by which both were actuated, proved a powerful bond of union between them; and in furtherance of their scheme of uniting all the smaller maritime powers into one vast confederation against England, Paul concluded a convention with Sweden and Denmark for the purpose of opposing the right insisted on by England of searching neutral vessels. The result was that the English government sent a fleet into the Baltic under Nelson to dissolve the coalition, at the close of March, 1801. Paul was preparing to give material aid to the Danes, when a conspiracy was formed at St. Petersburg to put a stop to the capricious despotism under which all classes of men in Russia were groaning. The conspirators, whose numbers included count Pahlen, the most influential man at court, gen. Beningsen, Uwarow, and many other distinguished nobles and officers, appear originally to have intended only to force Paul to abdicate, but his obstinate disposition led to a scuffle, in which the emperor was strangled, Mar. 24, 1801.

PAUL I., Pope, d. 767; b. Rome; brother of Stephen III., whom he succeeded 757. He was the candidate of the Frankish party, which was opposed by the Italian party, who presented Theophylactus for the vacancy; and the latter at first refused to acknowledge him, but finally submitted. He secured the favor of Pepin I., as a protection against the Byzantines and Lombards. He strengthened the papal power, and in 766 was reconciled to Desiderius, king of the Lombards, who endowed the church with some of his property. His anniversary is June 28.

PAUL II., Pope, born Italy, 1418; nephew of Eugenius III. His name was Pietro Barbo, and he had been archdeacon of Bologna, and bishop of Cervia before his elevation to the pontificate in 1464. At the beginning of his reign he reformed a number of abuses in the papal court, and attempted to form a general alliance of Christian sovereigns against the Turks. His relations with many of those sovereigns were unfriendly. He demanded from Louis XI. the revocation of the pragmatic sanction, attacked Podiebrad, king of Bohemia, as a Hussite, and caused a civil war in that country, and quarreled with Ferdinand in regard to some fiefs in Naples. In 1468, after the capture of Negropont by the Turks, he ordered a general peace throughout Italy, on pain of excommunication, but he died before the arrangements for a combined campaign against the Turks had been completed. He d. 1471.

PAUL OF SAMOSATA, so called from his native city; b. early in the 3d century. Concerning his childhood and youth little is known. He was at first a sophist and obtained admittance among the clergy in some unknown way. He became bishop of Antioch, 260 **A.D.**, probably through the influence of Zenobia, queen of Palmyra, who admired his learning and genius. His enemies assert, but without proof, that his character previous to his appointment was in some respects unworthy of the episcopal office. After his elevation, if the current accounts are to be trusted, he was rapacious, arrogant, and vain. In addition to his spiritual office, he obtained the secular appointment of procurator, which, yielding him large emoluments, prompted him to surround himself in the church with greater pomp and ceremonial than had hitherto been witnessed. He built an episcopal judgment seat and a lofty throne which were screened from public view. He traveled, attended by a large retinue, reading letters and dictating answers along the road to display his manifold and urgent engagements. During public worship he allowed persons of both sexes to applaud him according to the custom in theaters. In his preaching he freely denounced others, and praised himself more, as Eusebius says, "after the manner of a rhetorician, or a mountebank, than of a bishop." He allowed praises of himself to be sung publicly in church during the Easter services, and encouraged bishops of less important cities around him to extol him in their sermons as an angel from heaven. Besides these definite charges he was under suspicion of others more secret. His theological heresies, which closely resemble those of Sabellius, aroused more opposition against him than his notorious faults or suspected crimes. Over his wickedness many declared that "they groaned in secret, yet feared to accuse him, but when he set himself in opposition to God they were compelled to depose him, and elect another bishop in his place." Several councils were convened to consider his case; by the last of which, held about 269 **A.D.**, he was divested of his office and excommunicated. Trusting to the favor both of Queen Zenobia and of the populace, he refused to vacate the episcopal residence, in which also the meetings of the church were held. In 272 the emperor Aurelian, having conquered Zenobia, referred Paul's case to the bishops of Rome and of Italy. They decided against him. There is no notice either of the time or place of his death.

PAUL, VINCENT DE, one of the most illustrious saints of the Roman Catholic church, was born of humble parentage at Pouy, in Gascony, in the year 1577. The indications of ability which he exhibited led to his being sent to school at Toulouse. He became an ecclesiastical student, and was admitted to priest's orders in 1600. On a voyage which he was making from Marseilles to Narbonne his ship was captured by corsairs, and he with his companions sold into slavery at Tunis, where he passed through the hands of three different masters. The last of these, who was a renegade Savoyard, yielded to the exhortations of Vincent, resolved to return to the Christian faith, and, with Vincent, made his escape from Barbary. They landed in France in 1607. Having gone thence to Rome, he was intrusted with an important mission to the French court in 1608, and continued for some time to reside in Paris as the almoner of Marguerite de Valois. The accident of his becoming preceptor of the children of M. de Gondy, the commandant of the galleys at Marseilles, led to his being appointed almoner-general of the galleys in 1619. It was at this time that the well-known incident occurred of his offering himself, and being accepted, in the place of one of the convicts, whom he found overwhelmed with grief and despair at having been obliged to leave his wife and family in extreme destitution. Meanwhile he had laid the foundation of what eventually grew into the great and influential congregation of priests of the missions, an association of priests who devote themselves to the work of assisting the parochial clergy by preaching and hearing confessions periodically in those districts to which they may be invited by the local pastors. The rules of this congregation were finally approved by Urban VIII. in 1632; and in the following year the fathers established themselves in the so-called priory of St. Lazare, in Paris, whence their name of *Lazarists* is derived. From this date his life was devoted to the organization of works of charity and benevolence. To him Paris owes the establishment of the foundling hospital, and the first systematic efforts for the preservation of the lives, and the due education of a class theretofore neglected or left to the operation of chance charity. The pious sisterhood of charity is an emanation of the same spirit, and Vincent was intrusted by St. Francis of Sales with the direction of the newly-founded order of sisters of the Visitation. The queen, Anne of Austria, warmly rewarded his exertions, and

Louis XIII. chose him as his spiritual assistant in his last illness. He was placed by the queen-regent at the head of the *conseil de conscience*, the council chiefly charged with the direction of the crown in ecclesiastical affairs; and the period of his presidency was long looked back to as the golden era of impartial and honest distribution of ecclesiastical patronage in France. Vincent was not, in any sense of the word, a scholar, but his preaching, which (like that of the fathers of his congregation of Lazarists) was of the most simple kind, was singularly affecting and impressive. He left nothing behind him but the *Rules or Constitutions of the Congregation of the Mission*, 1658; *Conferences* on these constitutions, 4to; and a considerable number of letters, chiefly addressed to the priests of the mission, or to other friends, on spiritual subjects. He died at the advanced age of 85, at St. Lazare, Sept. 27, 1660, and was canonized by Clement XII. in 1737. His festival is held on July 19, the day of his canonization.

PAULDING, a co. in n.w. Georgia, drained by the Tallapoosa and Etowah rivers; 340 sq.m.; pop., '90, 11,948, chiefly of American birth, with colored. The surface is uneven and hilly, and the soil only fairly fertile; Indian corn, cotton, and pork are the chief products. There are extensive forests of pine and several kinds of oak. Co. seat, Dallas.

PAULDING, a co. in n.w. Ohio; bounded on the w. by Indiana; drained by the Maumee and Auglaize rivers and several creeks; intersected by the Wabash, and the Cincinnati, Jackson, and Mackinaw railroads; about 414 sq. m.; pop. '90, 25,932, chiefly of American birth. The surface is level and much of it is morass. Oats, hay, Indian corn, and wheat are the staples. Co. seat, Paulding.

PAULDING, Hiram, 1797–1878; b. N. Y.; son of John Paulding, one of the American soldiers who captured André; entered the Navy, Sept. 1, 1811; served with distinction under Commodore Macdonough in the battle of lake Champlain, and received a sword from congress in recognition of his services; he was made lieutenant, 1816; afterwards master commander; and in 1823 accompanied navy commissioner David Porter on a successful expedition to suppress piracy in the gulf of Mexico. In 1844 he was raised to the rank of captain, and in command of the *Vincennes* cruised in the West Indies. He captured Gen. William Walker the filibuster, on his second landing at Punta Arenas, Nicaragua. In Dec., 1860, he was presented with a sword by the republic of Nicaragua, in acknowledgment of his services, and received an offer of a tract of land, which he was not permitted by the U. S. senate to accept, but instead was censured by President Buchanan, who released Gen. Walker. In April, 1861, he was commander of the Norfolk navy yard, and in 1861 he was made rear-admiral on the retired list. In 1862–65 he was in command at the Brooklyn navy yard, and in 1866 was appointed governor of the Philadelphia naval asylum. In 1831 he published a *Journal of a Cruise among the Islands of the Pacific*. He was port admiral at Boston, 1869–71.

PAULDING, James Kirke, an American author, was born in Dutchess co., N. Y., Aug. 22, 1779. His father was a farmer, descended from the early Dutch settlers. Self-educated, and early developing a tendency to literature, he was a friend of Washington Irving, and wrote a portion of *Salmagundi*. During the war of 1812 he published the *Diverting History of John Bull and Brother Jonathan;* in 1813, a parody of the *Lay of the Last Minstrel*, entitled *A Lay of the Scottish Fiddle;* and in 1814, a more serious work, *The United States and England*, a defense against articles in the *Quarterly Review*. This work attracted to him the attention of President Madison, and caused him to be appointed a member of the board of naval commissioners. In 1816 he published a defense of the southern states and of slavery in *Letters from the South, by a Northern Man;* in 1819, a new series of *Salmagundi;* in 1822, *A Sketch of Old England, by a New England Man;* and in 1824, *John Bull in America, or the New Munchausen*, a satire on the writings of certain British tourists. This was followed by *Konigsmarke*, a novel (1825); *Merry Tales of the Three Wise Men of Gotham* (1826); *The New Pilgrim's Progress* (1828); *Tales of a Good Woman* (1829); *Book of St. Nicholas* (1830). These works, mostly humorous and satirical, had various degrees of local popularity; but in 1831 he produced *The Dutchman's Fireside*, a novel that was reprinted in England, and translated into French and Dutch; and in 1832, *Westward Ho!* which attained to a similar popularity. These were followed by a *Life of Washington* (1835), *Slavery in the United States* (1836), in which the institution is defended on social, economical, and physiological grounds. He held at this period the lucrative post of navy agent of New York, and was by Mr. Van Buren appointed secretary of the navy, which gave him the position of cabinet minister. At the close of Mr. Van Buren's presidency in 1841, Mr. Paulding retired to a country residence at Hyde Park, N. Y., where he wrote *The Old Continental*, a novel (1846); *The Puritan and his Daughter* (1849); and with his son, a volume of Plays and Fairy Tales. He died at Hyde Park, New York state, April 6, 1860.

PAULDING, John, 1758–1818; b. N. Y., a revolutionary soldier who served through the war, taken prisoner three times; one of those who captured Maj. André, 1780, receiving for the service a silver medal from congress, bearing the inscription *Fidelity*, on one side, and on the reverse *Vincit amor patriæ*. In 1827 the city of New York erected a monument to his memory at Peekskill, where he was buried; and he

as well as his comrades in the capture, Van Wart and Williams, have had counties in Ohio named in their honor.

PAULI'CIANS, an ancient sect of the eastern empire, who, by Catholic writers, are reckoned an offshoot of the Manichæans (q.v.). According to Peter of Sicily and Photius, the sect originated in Armenia from two brothers, named Paul (from whom it is alleged to have received its name) and John, who flourished in the 4th century. Others trace it to an Armenian named Paul, who lived under Justinian II. The Paulicians were at all times treated with much suspicion, and repressed with great severity, by the eastern emperors; Constans, Justinian II., and Leo the Isaurian especially labored to repress them, and indeed, with the exception of Nicephorus Logotheta (802–811), it may be said that all the emperors, with more or less rigor, persecuted them. Their greatest enemy, however, was Theodora (841–855), who, having ordered that they should be compelled to return to the Greek church, had all the recusants cruelly put to the sword or driven into exile. A bloody resistance, and finally an emigration into the Saracen territory, was the consequence; and it is from the Paulician settlers in Bulgaria (Catholic historians) that the Manichæan doctrines which tinged the opinions of most of the mediæval sects are supposed by Roman Catholic historians to have found their way into the eastern provinces of the western empire. Even so late as the 17th c., according to Mosheim (ii. 238), there was a remnant of this sect existing in Bulgaria.

It is proper, however, to notice that a very different view of the character and doctrines of the Paulicians has been advocated by such modern writers on ecclesiastical history as Gieseler and Neander, according to whom they had their origin from one Constantine of Mananalis (near Samosata), an Armenian, who had received a present of two volumes—one containing the four gospels, and the other the epistles of Paul—and who afterwards assumed the name of Paul, in testimony of his great veneration for that apostle. The distinctive characters of his doctrine and that of his followers were the rejection of the worship of the Virgin, the saints, and the cross, the denial of the material presence of Christ in the eucharist, and the assertion of a right freely to search the Scriptures; and the charge of Manichæism was falsely brought against them by their persecutors.

PAULINUS, Saint, d. 644; sent to England by Pope Gregory I. in 601. In 625 he was made bishop by Justus the archbishop, and went to Northumbria, in attendance on Æthelburga, daughter of Æthelbert, king of Kent, and wife of Edwin, king of Northumbria. In 627 King Edwin, with many others, was baptized. Soon afterwards Paulinus was consecrated archbishop of York, founded the cathredral, and in 631 ordained Honorius archbishop of Canterbury. On the death of King Edwin in 633 the Northumbrians relapsed into heathenism, and Paulinus fled to Kent, where he was raised to the see of Rochester.

PAULINUS, Pontius Mesopius Anicius, Saint, 353–431, b. France; a pupil of the poet Ausonius, who secured him the favor of the emperor Gratian. He attained the dignity of *consul suffectus*, and was married to a wealthy lady named Therasia. Through the efforts of St. Ambrose he was converted to Christianity, distributed most of his property among the poor, and continued, for a time, to reside in Spain. He was ordained a presbyter in 393, at Barcelona, but soon left Spain for Rome. On his way he was warmly received by St. Ambrose at Florence. He failed to win the favor of pope Siricius, who regarded his ordination as irregular. In 394 he went to Nola, where he had an estate. Near the city was the tomb of the martyr Felix, over which a church had been built, and a few cells for pilgrims. Here Paulinus lived for fifteen years in a strict monastic fashion, except that his wife seems to have been with him. In 409 he was made bishop of Nola, a position which he retained till his death. He was present at the council of Ravenna in 419. Of his works there have been preserved 50 epistles, 32 poems, and a tract called *Passio S. Genesii Arelatensis.* His name is of frequent occurrence in the letters of Augustine and Jerome.

PAULIST FATHERS, a society of missionary priests of the Roman Catholic church, founded in New York in 1858 by the Rev. Isaac T. Hecker and some other priests. It is called the congregation of the missionary priests of St. Paul the apostle. Hecker and his associates belonged to the order of the Redemptorists engaged in home mission work in New York, but desired to form an organization composed chiefly of those whose native tongue was English. Archbishop Hughes approved, and Pius IX sanctioned, the plan. The congregation reports a growing number of houses and churches in many localities, and several students preparing for the ministry. The Paulists originated the Catholic publication society, and the monthly periodical *The Catholic World.* Hecker, Stone, and Hewitt have published several theological works. These priests are very earnest in their preaching, holding "missions," which correspond to revival services in Protestant churches.

PAULLI'NIA. See Guarana Bread.

PAULOWNIA, the common, and also generic name of an ornamental tree brought from Japan in 1840, named in honor of the princess Anna Paulovna of the Netherlands, afterwards queen. It belongs to the order *Scrophulariaceæ* or figwort family, of which it is a remarkable member, attaining a height of 20 to 30 feet. It has somewhat the appear-

ance of a catalpa, the leaves being similar, but much more downy. The flowers make their appearance in April and May. They are somewhat cylindrical, with rounded lobes at the mouth, and clustered in large panicles. Each flower is from one and a half to two inches long, of a beautiful violet color, and having a slight agreeable odor. Calyx, fine, segmented, thick, and leathery, densely covered with a rusty down. Capsules 2-valved, ovate, and pointed, an inch or more in length, containing numerous small, winged seeds. The tree was at one time much sought after in the United States, as it was preceded by a great reputation, but it has since fallen somewhat from its high favor. It is not hardy north of New York, and even there and further south it often fails to bloom for several seasons in succession. The flower buds are formed in the previous season, a severe winter generally blights them, and the tree is not ornamental without its flowers. The growth of the tree in a favorable climate is very rapid and vigorous, and the leaves are remarkable for their size and fine appearance, often measuring two feet in breadth on young trees. It is said that a good way to cultivate the tree is to cut it down to the ground every year and use it as a sort of hedge or division, the young shoots growing very rapidly and becoming ornamental on account of their luxuriant leaves.

PAULUS, Heinrich Eberhard Gottlob, a German theologian of great note in his day, and one of the leaders of the Rationalists at the close of the last and the first quarter of the present c., was b. at Leonberg, near Stuttgart, Sept. 1, 1761. He gave himself to the study of oriental languages at Göttingen, and afterwards prosecuted it in London and Paris. In 1789, he was called to the professorship of oriental languages at Jena, and in 1793 became professor of geology, on the death of Döderlein. Here he especially signalized himself by the critical elucidation of the Scriptures of the Old and New Testament, in so far as they presented oriental characteristics. The results of his labors may be seen in his *Philologisch-kritischen und historischen Commentar über das Neue Testament* (4 vols. Lüb. 1800–4); *Clavis über die Psalmen* (Jena, 1791); *Clavis über den Jesaias*, and other writings belonging to this period of his literary activity. In 1803 he removed to Würzburg; in 1808, to Bamberg; in 1809, to Nuremberg; and in 1811, to Ansbach. During these various changes he had ceased to be a professor, and become a director of ecclesiastical and educational affairs; but in 1811 he accepted the professorship of exegesis and ecclesiastical history at Heidelberg. In 1819 he started a kind of historico-political journal entitled *Sophronizon*, in which he continued to write for about ten years. His contributions were marked by weighty sense, moderation, and knowledge of his various subjects, and won him great applause at the time. As a theologian, he is generally looked upon as the type of pure unmitigated rationalism—a man who sat down to examine the Bible with the profound conviction that everything in it represented as supernatural was only natural or fabulous, and that true criticism consisted in endeavoring to prove this. From his numerous writings, we select for mention the following: *Memorabilien* (Leip. 1791–96); *Sammlung der merkwurdigsten Reisen in den Orient* (7 vols. Jena, 1792–1803); *Leben Jesu als Grundlage einer reinen Geschichte des Urchristenthums* (2 vols. Heidelb. 1828); *Aufklärende Beiträge zur Dogmen-Kirchenund Religionsgeschichte* (Bremen, 1830); and *Exegetisches Handbuch über die drei ersten Evangelien* (3 vols. Heidelb. 1830–33). Paulus died, Aug. 10, 1851, at the advanced age of 90—having lived long enough to see his own rationalistic theory of Scripture give place to the "mythical" theory of Strauss, and that in its turn to be shaken to its foundations partly by the efforts of the Tübingen school, and partly by those of Neander and the "broad church" divines of Germany. See Paulus's *Skizzen aus meiner Bildungs-und Lebensgeschichte zum Andenken an mein 50-jähriges Jubiläum* (Heidelb. 1829), and Reichlin Meldegg's *H. E., G. Paulus und Seine Zeit* (2 vols. Stuttg. 1853).

PAU'LUS ÆGINE'TA, a celebrated Greek physician, was b. in the island of Ægina, and flourished during the conquests of the caliph Omar in the 7th century. Of his life we know almost nothing more than that he pursued his medical studies first at Alexandria, and afterwards in Greece and other countries. His forte lay in surgery and obstetrics, in the latter of which departments of medicine his practice was great. He abridged the works of Galen, and was deeply read in those of Ætius and Oribasius, while he always exercised an independent judgment in forming his conclusions. His descriptions of diseases are brief and succinct, and also complete and exact. He often grounds his explanation of morbid phenomena on Galen's theory of the cardinal humors; while in surgery his writings abound with novel and ingenious views. His works—the principal of which is commonly called *De Re Medica Libri Septem* (Lond. 1834)—have passed through many editions, of which the best is that completed at Lyons in 1567, and they have also had many translators, of whom the best in English is Dr. Francis Adams.

PAULUS DIACONUS (also called Paulus Levita, both surnames being derived from his ecclesiastical office), one of the most learned men of his time, and the greatest Lombard historian, was born of a noble Lombard family at Friuli about 725. His father's name was Warnefrid. He received a superior education at Pavia, at the court of the Lombard king Ratchis, and appears to have continued at court during the reigns of his successors, Aistulf and Desiderius, and to have accompanied Adelperga, the daughter of Desiderius, whose education he had conducted, to the court of her husband, duke Arichis of Beneventum. For her he wrote, in 781, after he had become an ecclesiastic, one of his principal works, his *Historia Romana*, a work of no authority, as it is a mere compilation

from works which we possess, but which was greatly used during the whole of the middle ages, as the many manuscripts, recensions, and continuations of it attest. An edition of the genuine text is still awanting, but a great part of it is given in Muratori's *Rerum Italicarum Scriptores*, vol. i. (Milan, 1728). In 781 Paulus became a monk of Monte Casino; but afterwards went to France, and won the esteem of Charlemagne in a high degree by his character and learning. He aided that monarch in his schemes for the promotion of learning, and introduced the study of the Greek language into France. He made a collection of homilies from the best sources, at the emperor's desire, known as the *Homilarium*, often printed between 1482 and 1569, and translated into German and Spanish. At the request of Angilram, bishop of Metz, he also wrote a history of the bishops of Metz, *Gesta Episcoporum Mattensium* (printed in Pertz's *Monumenta Germaniæ Historica*, vol. ii.), the first work of the kind on the n. of the Alps, but the example of which was soon very generally followed. In 787, he returned to his convent, where he remained till his death, which is said to have taken place in 797. In the latter years of his life he wrote his history of the Longobards (*De Gestis Langobardum, Libri* 6), but did not live to complete it, bringing down the history only to the dath of Liutprand in 744. There are several editions or this work, the best of which is contained in the work of Muratori. It is characterized by remarkable candor, and a style unusually pure for that age. The high repute in which this work also was long held is attested by the great number of manuscripts and continuations. Paulus was likewise the author of a number of theological works, and of some hymns and letters still extant.

PAUL VERONESE. See CAGLIARI, PAOLO.

PAU'PER COLONIES are organized settlements of paupers, founded for the purpose of relieving the poor, morally as well as materially, by providing them labor, agricultural as far as possible, compelling them to work, and maintaining among them the utmost economy. Experiments in this direction were made in the last century at Flottbeck, near Hamburg, and at Liancourt in France. Only in the Netherlands has this method of dealing with the pauperism of a nation been seriously and extensively tried. In 1818, under the direction, chiefly, of gen. van den Bosch, an association of 20,000 members began planting P. C. in Antwerp in the s., and in Friesland, Overyssel, and Drenthe in the n. The results fell short of the expectations that had been formed; the membership declined, and the association had from time to time to draw subsidies from the state. At length, in 1859, such was the crisis in the association's finances, that the state took over into its own hands the colonies of Ommerschans and Veenhuizen, the society retaining under its own administration Fredericksoord and Willemsoord, Klein and Gross Watern, and Vledder. Then the association had the charge of 2608 colonists, 89 boarders, 115 orphans, and 207 officials—altogether, 3054, of whom 1552 were men. In 1866 the population of the beggar colonies was 5475, of whom 4685 were "beggars," 310 old soldiers, and 190 orphans, foundlings, and deserted children. Their live stock counted 835 head of cattle, 134 horses, 1278 sheep, and 113 pigs; and the land under cultivation measured 2108 acres. They made their own cloth, and produced yearly 400,000 coffee sacks and 600,000 meters of cloth. In 1875 the government colonies contained 2809 persons. These institutions are a great expense to the nation, but have reduced the numbers and improved the social condition of destitute people. The position of the colonists has of late improved, and their homes show signs of industry and comfort. When working in the factories, a tenth part of their earnings is placed in a reserve fund, to be paid to them in winter or in time of sickness. The Dutch institution has found imitation on a small scale in Belgium, France, Bavaria, etc.

PAUPERISM, the state of indigent persons supported or aided at the public charge, was recognized: 1, under the Mosaic economy, by special enactments authorizing the right of gleaning, setting apart portions of the produce of the land in sabbatical years, providing for re-entry in years of jubilee, enjoining loans without interest, forbidding perpetual bondage and regulating the manumission and redemption of bondsmen and bondswomen, allotting portions of the tithes, providing for the participation of the poor on festal occasions, and instituting the daily payment of wages; 2, among the Greeks, by public donations, such as the free distributions of corn, the so-called *cleruchiæ* among colonists (who, being mostly poor, were to be raised to a state befitting the dignity of Athenian citizens), the revenues from the mines, and the *theorica*, in the first instance designed to enable the poorer classes to attend theatrical exhibitions at the public cost, but afterwards considerably extended; 3, among the Romans, as one of the duties of government, the many frumentarian laws providing not only for the purchase and sale of corn to the people at a low price and at a price below cost, but also for its gratuitous distribution. The first legal provision of the second nature was made 123 B.C.; that of the third in the lex Clodia, 58 B.C., with the result that the free distribution of corn absorbed one-fifth of the entire revenue of the state. The great danger of the practice induced Cæsar to apply a remedy, in reducing the number of the recipients, by the rigorous exclusion of all persons unable to prove their Roman citizenship from the list of corn-receivers, from 320,000 to 150,000, and it was enacted that this number should not be exceeded. The *congiaria*, which in the early times of the republic were contribu-

tions of a *congius*, of oil or wine (= about 6 pints), designated afterwards liberal donations to the *people* (as contrasted with the *donativa*, or donatives to the *soldiers*) of oil, wine, corn, money, or other things, and always denoted that they were gratuitous. The limits fixed by Cæsar were soon exceeded, and the number of recipients had risen, 5 B.C., to 320,000. Augustus, 2 B.C., revived many of Cæsar's regulations, reducing the number to 200,000 entitled to receive corn on payment of a small sum, and providing for the gratuitous distribution to the absolutely indigent, who were furnished for the purpose with certain tokens, called *tesseræ nummariæ* or *frumentariæ*. These *tesseræ* became very valuable property in course of time, when the distribution of corn had become entirely gratuitous, and could be sold and bequeathed by will. At a still later period the public bounty, instead of supplying corn, furnished wheaten bread, baked at the public charge. Constantine extended the same privilege to Constantinople, with the amplification that the privilege, which at Rome was personal, became in the new capital attached to the *houses*. The daily allowance at Constantinople was, according to Socrates, eight myriads of corn, i.e., either of *modii* or of loaves. The history of Constantinople proves the disastrous consequences of the emperor's short-sighted policy, just as in the decline and fall of imperial Rome the policy of congiaria and donatives was a powerful factor of disintegration. When Odoacer reigned in Italy (476–90 A.D.), and the tributary harvests of Egypt and Africa were withdrawn, Pope Gelasius affirmed with strong exaggeration, that in Æmilia, Tuscany, and the adjacent provinces the human species was almost extinct. The plebeians of Rome were reduced to starvation, and actually perished when the cessation of the congiaria, a soil exhausted by famine, war and pestilence, the decay of agriculture, habits of idleness, and the interruption of commerce, left them in the most deplorable state of helplessness (see Gibbon, ch. 36). The care for the poor, at that period, passed from the hands of an impotent government into those of the church, and was dispensed on the principle of Christian charity. Through the instrumentality of the church the globe has been covered with countless institutions of mercy, of which the pagan world was utterly ignorant. But that subject belongs elsewhere, and is here only referred to for the purpose of indicating that the evil and spread of poverty have increased with the multiplication of charitable institutions. That aspect of the case, which is a stubborn fact, belongs to the venue of political economy, which has proved beyond all doubt that charity ceases to be charity when it supports and fosters idleness and destroys what has been felicitously called the parsimony of foresight. It is not the whole truth to say that charity is an unproductive expenditure: discriminating charity *is* productive expenditure, and to the latter belong certainly popular education, savings banks, insurance companies, law associations, and broad efforts for the suppression of vice. We have to deal with two forms of pauperism—one the result of improvidence, the other the result of providential visitations; and to the alleviation of both the attention of legislative bodies and philanthropists should be directed.—A brief survey of what has been done and is doing in that direction among the leading civilized nations is now in place. Beginning with Rome under papal rule, and the Latin-Catholic countries, excepting France, the affairs of the poor were generally administered, and with the qualifications above-named, well and exhaustively, though not without a tinge of bigotry, through ecclesiastical channels. The convents, monasteries, hospitals, and asylums were often liberally endowed and supported by public and private munificence. Many of the latter, even since the suppression of religious orders, are maintained, wholly or in part, at the public charge. Relief is often afforded by means of money, food, fuel, clothing, and tools. In Austria the "Institutes of the Poor," composed of the parochial minister, two persons called "fathers of the poor," and a controlling officer, all duly recognized by the state, are charged with the administration of hospitals, asylums, etc., and the dispensation of relief to the indigent. The system in cities is municipal, in country districts parochial in the English sense. In Switzerland, the communes must provide for their poor if disabled, and find work for those who are able. In Germany, a poor-tax is raised either by state assessment or self-assessment; communal and, in many instances, congregational boards afford relief; poor-houses, asylums, orphanages, and hospitals, mostly supported at the public charge, are abundant. In Russia, most of the comparatively few charitable institutions are supported by government. Hospitals outside the large cities are not frequent. In Norway and Sweden the public charities are administered by the church which is established; the system resembles that of Germany. The characteristic feature of the Danish system is the provision of monetary relief by loans. Holland compels all able-bodied paupers to support themselves by work in certain public institutions. The relief of destitute families in free pauper colonies flows from private sources. In Belgium, besides the vast array of charitable religious institutions taking cognizance of multifarious forms of distress, exist the public alms-houses in the different departments, in which able-bodied paupers are compelled to work for their support. In France, besides the religious charitable work done in hospitals, asylums, homes, etc., which began at a very early period (the Hôtel Dieu at Paris, formerly known as the Maison Dieu, was founded in the 7th c.), public relief dates back as far as the edict of John II. in 1350. The institution of boards of charity, begun at Lyons in 1531, enlarged at Paris in 1544, and extended in 1566 over France, with power to levy a poor-rate on all property, continued in operation until 1791. In successive reigns, in periods of general distress and destitution, paupers found employment in

industrial hospitals; public works were constructed to give employment to the poor; and the colonies were to be stocked with the surplus pauper population, which at times increased to a prodigious extent. The public almshouses (*dépôts de mendicité*), originated in 1793, were extended over all the departments in 1808, but speedily used for other purposes, revived in 1830, with the important modification that they should be for the reception of paupers required to work for their support. Inadequate to meet the evil, private benevolence, of strictly voluntary character, has created a large number of local bureaux of charity, which, however, as well as all philanthropic institutions, are under the supervision of government, which, in the administration of those of Paris, is represented by the prefect of the Seine as presiding officer of a council of clerics and laymen. Similar boards exist throughout the country. See Poor and Poor-Laws.

In the United States pauperism has from a very early period attracted the notice of the state legislatures and philanthropists, and originated a large number of charitable institutions, supported either at the public charge, or by private benevolence. In most of the states are state, county, or district almshouses or poor-houses, asylums for the insane and other forms of distress, orphanages and hospitals. The states generally assume the charge of the pauper insane, the counties and cities that of the strictly poor, and private charity that of the sick poor. The state legislatures make also very liberal grants to the different charitable institutions. The systems are by no means uniform, and differ in the various states, and the want of system is painfully apparent in the great paucity of statistics. Pauperism has grown with the growth of the country, and its increase after the rebellion was very marked; it prevails to a greater extent in winter than in summer, and thrives more in cities than in the country. It speaks well for the amelioration conditions of our republic that the vast immigration, which includes of course large numbers of paupers, adds a hardly perceptible percentage to our pauper population. The majority of those who leave Europe as paupers swell the ranks of the industrious and productive. The manifest tendency of pauperism to assume formidable dimensions in large cities suggests the expedient of devising a system for transferring the redundant unproductive labor collected in our large cities, to localities where it may at once become productive. There are not less than 100,000 unemployed persons in New York and Brooklyn, who might find profitable work in the interior of New York, Pennsylvania, and notably in certain portions of the south and west. Savings' banks for the benefit of those who have employment in summer and none in winter are also a step in the right direction. According to the U. S. census of 1880, the pauper element is set down as 88,665 in a population of 50,155,783; this is a palpable understatement of that number. New York and Pennsylvania are credited with 28,000. The cost of maintenance of paupers in the U. S. is estimated at not less than $10,000,000, half of which is allotted to New York, Pennsylvania, and Massachusetts. This is a fair sample of the bewildering confusion in all statistics bearing on this important subject, and impairs their value for comparison. According to Hausner, the smallest pauper population in Europe is in Prussia and Austria, then comes France, then Great Britain, Switzerland; and the small states of Holland and Belgium have the largest. Holland has 1 pauper to every 7 inhabitants; France 1 in 29½ (a Swiss authority says 1 in 9); Great Britain 1 in 22; Germany and Austria together, 1 in 30. It is mere guess-work to give the proportion in the United States, but it is safe to say that it exceeds 1 in 100. The practice of administering relief varies in the different countries. In-door relief in France is restricted to the insane, the sick and decrepit, and to abandoned children. Illegitimate children are given to their mothers, who receive out-door relief; the greater number of other children are boarded out at the public charge. Out-door relief is practiced on a large scale with very satisfactory economical results. In Prussia, likewise, out-door relief is the favorite mode. The system adopted at Elberfeld (and imitated elsewhere) combines features worthy of all acceptation. Judicious persons, representing both public and private charity, seek for the deserving poor by systematic house-to-house visitation and dispense to them the relief flowing from both sources. Similar work is done in some of our large cities, and the urgency of measures blending public charity and private benevolence is very widely felt. An effort to combine the independent charitable organizations in New York city was begun, in 1882, and with such success that in the year 1891 the following agencies were in co-operation: 55 general societies for out-door relief, 9 national societies for out-door relief, 36 medical charities, 19 asylums and institutions for in-door relief, 203 churches and congregations. The city is divided into districts, each having a governing committee, paid agent, and body of friendly visitors. An alphabetical street register is kept, showing how many families have received charitable relief during each year or have had members in the penitentiary. See Mendicancy; Beggars.

PAUSA'NIAS, a famous Spartan regent and general, the son of Cleombrotus, and nephew of Leonidas. He commanded the confederate Greeks in the important battle of Platæa (479 B.C.), in which the Persians were totally routed, and their leader, Mardonius, slain. He then marched his troops against Thebes, and compelled the inhabitants to give up the chiefs of the Persian party to him for punishment. Elated by this victory, however, he became in an extreme degree haughty and vain-glorious, took all the credit to himself, and allowed none to the Athenian generals, Aristides and Kimon, who commanded under him, and treated all the other Greeks as if the Spartans were their lords.

Nevertheless, he still continued his conquests, capturing Cyprus and Byzantium. It was here he first began to play false to Greece. He entered into secret negotiations with Xerxes, with the view of becoming ruler, under the Persian monarch, of the whole country, and in his journey through Thrace, even adopted the dress and luxurious habits of a Persian satrap, and surrounded himself with a body-guard of Persians and Egyptians. Being recalled, on account of these things, by the Spartans, his former services procured his acquittal. He then returned to Byzantium, where he renewed his traitorous intrigues, was expelled from the city for a criminal assault upon a Byzantine lady, withdrew to the Troad, and there continued his treachery. He was a second time called to account by the Spartan ephors, but again escaped, though with greater difficulty. Yet his passion for the sovereignty of Greece, even though at the expense of the national liberties, once more drove him to play the traitor. He tried to stir up the Helots, but was taken in his own net. A Helot betrayed him. When Pausanias found his position desperate, he took refuge in a temple of Athene. Hereupon the people blocked up the gate of the temple with heaps of stones, and left him to die of hunger, his own mother depositing the first stone.

PAUSANIAS, one of the most eminent of Greek geographers and historians, was probably a native of Lydia in Asia Minor, and was born some time in the 2d century. He traveled through almost all Greece, Macedonia, and Italy, and also through part of Asia and Africa, and composed from his observations and researches an Itinerary, entitled *Hellados Periēgēsis*, in ten books, describing the diferent parts of Greece, and giving a particular account of the monuments of art and of the legends connected with them. His style is by no means pure; but in matters of his own observation he is most trustworthy, and his work is, on many subjects, one of the most valuable sources of information that we possess. There are numerous editions of his work: the oldest was printed at Venice in 1516 by Aldus; and the most recent is that by J. H. C. Schubart and C. Walz (3 vols. Leip. 1838–40). Translations of Pausanias exist in English, German, and French.

PAUW, Cornelis de, 1739–99; b. Amsterdam; educated at Göttingen. He is known as the uncle of the revolutionist Anacharsis Clootz. He became canon of Xanten in the duchy of Cleves; was afterwards appointed reader to Frederick II. of Prussia. He declined the place of an academician of Berlin and a bishopric at Breslau. He published works on the history and physiology of several nations and countries, among which were *Recherches sur les Américains*, designed to show the native inferiority of the savages of America; *Recherches sur les Egyptiens et les Chinois*, 2 vols.; *Recherches sur les Grecs*, 2 vols. These were translated into English. They contain curious information, but many unproved assertions made in a dogmatic spirit. His attacks on the Jesuits rendered him unpopular with the Roman Catholic clergy, though they respected his talents and learning.

PAUWELS, Ferdinand, b. Belgium, 1830; studied painting at Antwerp and under Woppers, and lived in Rome, 1852–57. His first picture, exhibited in 1851, was the "Meeting of Baldwin I. with his daughter Joan at Constantinople in 1206." His "Coriolanus" attracted much attention the next year, and gave him the means of living in Rome, where he still further improved himself, taking his subjects from the Old Testament and the hagiologies. From 1862 to 1872 he was professor at Weimar. He now lives in Antwerp. Among his pictures may be mentioned "Banished by Alva," 1861; "Reception by Louis XIV. of a Deputation from the Doge of Genoa," 1864; "Queen Philippa of England Relieving the Poor of Ghent," 1866; "Hans Pleinhorn, a Merchant of Nuremberg, surprised with his Family while engaged in Protestant worship," 1868.

PAVEMENT, flat stones or "flags" used for the flooring of halls, kitchens, and other apartments, and frequently for footpaths; also the stone covering of the roadway of streets. The stones used for flags vary in different districts, according to the geological formation of the neighborhood. The pavements now most commonly used in England and Scotland are the Arbroath and Caithness stones—the former a softer and more agreeable stone than the latter, which is exceedingly hard and slippery when wet. Pavement should be carefully laid on a solid dry foundation, and set in a good bed of concrete or lime, and the joints pointed with cement. It may also be laid on small dwarf walls, built of brick, so as to support all the edges—this is a good method for keeping the floor dry.

The Paving of Streets is of early date, and is, in fact, necessary to any considerable degree of civilization and traffic. The Romans paved their streets in the same elaborate and solid manner in which they paved their highways. See Roads. Portions of the ancient pavement of the streets of Rome are in use to the present day, and the pavement of Pompeii remains entire. It is laid with large blocks of stone of polygonal shape (like Cyclopean masonry), very carefully fitted together, and of considerable depth, and below there is a carefully prepared basis, often composed of several distinct strata. Some of the Italian towns—Florence, for instance—have still pavement of this description, and no foot pavement.

The mediæval cities were almost all unpaved till about the 12th c., when the main streets of the chief towns began to be protected with stone. The plan now adopted is nearly the same in all the cities of Europe. The first thing to be done is to secure or

make a solid foundation. This is done, where the natural substratum is not of a solid kind, by laying the street with a solid bed of concrete, having a slope from the middle to the sides to throw off the water. On the concrete is placed the real pavement, which is composed of blocks of granite, trap, or other tough rock. These should be rectangular, and the deeper the better. They are generally about 10 in. to 12 in. in depth, and 6 in. or 7 in. broad, and from 1 to 2 ft. in length. They should be all bedded and jointed in strong mortar. This is not often done, as it is thought sufficient to bed the stones in sand, and grout them with hot lime on the top. It is clear, however, that the more equal the stones are *in depth*, and the more solidly they are bedded, the longer they will last. Other materials besides stone have been tried for the paving of streets—such as blocks of wood with the end up, and blocks of cast-iron. The wooden pavement is delightfully easy, and not noisy, but in wet weather it is exceedingly slippery. Cast-iron is too hard, and causes too much jolting and noise.

The great obstacle in the way of really good pavement in modern streets is the necessity of frequently breaking it up for the laying and repairing of pipes for gas, water, etc. The true remedy—and, in the end, the cheapest—would be to have, in the chief streets at least, sub-ways or tunnels for drains and pipes, accessible without breaking up the pavement.

Although the term pavement is in its proper use strictly applicable only to a single kind of covering for a roadway, it is better here to regard it as including all the various materials used in constructing durable roads, and especially the streets of cities. The oldest, the best, and the most durable of all roads, the Roman, was built under wholly different conditions from any modern road. The raised center-part on which was the pavement was first excavated and rammed, then a double layer of flags was set, on this a kind of rough concrete some 18 in. thick, and on this the large thick paving-stones, random-jointed, but cut and butted to match with perfect accuracy, the whole in mortar and cement. This is a flat wall, not a roadway, and, costing more than any modern race would put into such an improvement, remained just as good as at first when, as at Pompeii, the chariot-wheels had worn ruts 4 in. deep in the stones.

Modern road-making dates only from the French superintendent of 1775, Tresaguet. He made a foundation of large flat flags, double thick, if desired; on this laid broken stone; and over all sand and fine stones. The system was good, but the administration of the time was without means of timely repair. Macadam's system, of about 1820, rests on two points; a dry road is a good road, therefore the compact earth itself will serve as a foundation, and there is no need of heavy flags beneath the surface proper; again, large stones never amalgamate, and dirt, sand, and soft stones, only turn to dust or mud. On a rammed and rounded surface, dry and in good condition, are successively spread two layers of medium cracked stone, and on these one or two more of fine cracked stone. All materials must be clean, and all stone must be hard. As soon as the materials are amalgamated by traffic, the road must be carefully surfaced and continually repaired. His whole thickness was of about 9½ in., and the crown of 1 in. to the yard. Telford made certain changes in construction, and Polonceau invented the heavy roller, to avoid the wear and tear of vehicles in consolidating the surface. At present the "metaled" road is laid on a foundation of clear screened gravel, on rammed cobble-stones or on a compacted clay; two layers of stone will be sufficient, and these are amalgamated by the roller. It is a mistake to suppose that the surface needs repicking and re-rolling at intervals; the surface is lightly picked when new materials are added, but all further disturbance should be avoided. Paved roads are usually made by ramming to a crowned surface, throwing on this ½ to ¾ in. screened sand, laying the pavings on this, and ramming to an even surface with a pavior's rammer. All old work, both in this and other countries, was done with cobble-stones; and although some modern work has been made of small flags with cuts upon them, the best and only satisfactory pavement is a block. These are either square or oblong, and should be about 1⅞ to 2, as deep as wide, and not tapered, as they must be turned and relaid when worn smooth. Joints should always break, nor should they ever be allowed to get in line with the street, since wheels immediately start a rut at the point. At the crossing of two streets, we usually set the blocks in circles, but abroad they are set at right angles to the X joining the corners. The best material for our common square-block pavement is the blue gneiss or the trap, but for long blocks, exposed to more fracture, any of the granites. For bridge-stones at crossings, greywack, quartzoze gneiss, the oölite limestones, or the compact granites. No gutter stones are needed, nor is there, as once supposed, an enormous pressure outwards, as of the thrust of an arch. The rounded surface, or crown, has been much reduced; originally $\frac{1}{40}$, $\frac{1}{70}$ is now enough. Metaled roads should be kept rather flat in the center, with a quicker slope at the sides; paved roads, the opposite. Friction is greater on paved roads, but traction is easier; in other words, carriages take the macadam; wagons, the pavement. The life of a pavement depends on the stone, and on the traffic, but in a city street of average use it may be called about 14 years. Some of the London pavements laid in mortar exceed this, and the Paris pavements, constantly repaired, do better yet. A road must be capable of drainage, since no road-bed is waterproof, the surface water being thrown off; but, infiltration taking place continually if on a sand, no impervious bed must be interposed, and if on

a clay, and it be found impossible to sand-fill below frost level, a crowned surface and a layer of cobble-stones must act as sub-soil drains. The surface of the road must not be broken up. In the newer streets of Paris, sewers and pipes are beneath the sidewalks, but in the older, as elsewhere, the streets are continually torn up by the workmen. With us the system is lax. To relay a long line of pavement over an excavation by throwing in dirt, and setting the pavement to one long joint, is to violate every known principle of road-building. Over a pipe the earth should be settled by water, then more put on and rammed; finally, for heavy traffic, 2 in. concrete at least under the stones. In laying block pavements everything depends upon careful hand-work. If a block drives too much or too little, it should be replaced, the joints should be carefully hand-filled with fine screened sand, and, a light covering of sand sprinkled over when finished, should be thoroughly flushed down before opening for traffic. No inch layer of sand need be left; it only chokes the sewers. Above all, every defect must be immediately remedied by competent workmen, with portable tool-boxes and equipments, under a responsible superintendent.

A bitumen covering to a sidewalk and, for easy traction and lessening of noise, to a road-bed, was the subject of experiment at Paris from before 1840 to 1854, when the first real success was effected. Many experiments with bitumen and wood were made in America from 1862 to 1874. A wood pavement must expose the cross-grain of the wood; it should be kyanized or otherwise treated against rot, and it should be graveled so that the sand, imbedding itself in the wood, offers a harder and, in wet weather, a rougher surface. The mixture of sand and bitumen does not set, and sand, lime, and bitumen show the effect of hot weather. The addition of asphalt, a calcareous earth soaked with bitumen, almost supplies the needed element, but the success of the process has never been attained without compression. Our wood pavements, and all the asphalt or bitumen surfaces laid on them or on sand, have failed. They soaked, rotted, burst, or sunk, because of inattention to the foundation. An asphalt pavement must be prepared as in France, by a concrete foundation, or by a mixed foundation ending in rolled gravel, as for a Telford metaled road; or it may be laid on a well-rammed, well-repaired block pavement. The asphalt, whatever mixture may be selected, is applied hot and rolled slightly and gradually, then heavily. It need be only thick enough to make a surface; it is easily cut out and easily repaired; and in fact, a street made piece by piece, is, if rightly done, after some traffic, homogeneous. The asphalt must, however, be perfectly free from damp, and in wet weather repairs can only be made by heat and under cover. The real objection is its slipperiness in wet weather, and the disagreeable and muddy condition it always shows in wet weather, unless continually swept and watered.

PAVIA, a province of Italy in the *compartimento* of Lombardy, having the Milanese on the n., Piacenza on the e., Alessandria on the s.w., Novara on the n.w., and Genoa on the s.; 1239 sq. m.; pop. 237,527. The length from n.w. to s.e. is about 40 m., the breadth at the narrowest portion, 10 miles. It is drained by the Po, the Ticino, and other small streams. It is intersected by a network of canals, among which are the Naviglio-di-Bereguardo, and the Naviglio-di-Pavia, supplying communication by water between Milan and the Lago Maggiore, the Ticino and Po, and by the Po with the Adriatic sea or gulf of Venice. Its surface is generally level, consisting exclusively of the broad plain of the Po. Its soil is remarkably fertile, and the vine, olive, and fruit trees yield abundant crops, and a specialty of the region is mushrooms. Hemp is raised, the pasturage is excellent, and much attention is paid to the raising of cattle. Silk and cheese are the principal manufactures. It is divided into the four districts of Bobbio, Mortara, Pavia, and Voghera. Capital, Pavia.

PAVI'A, a city of northern Italy, capital of the province of the same name, on the left bank of the Ticino, 20 m. s. of Milan, and 2 m. above the confluence of the Ticino and the Po and on the Milan and Genoa railway. A covered bridge of seven arches and an iron railway bridge connect the city with the *Sobborgo Ticino*, on the right bank of the river, and right through the town from n. to s. runs the *Corso Vittorio Emmanuele*. The city is large, surrounded by walls, and has an imposing appearance, bearing the impress of antiquity. In former times it was called the "city of a hundred towers;" but the palace of Theodoric, and the tower where Boëthius wrote the treatise *De Consolatione Philosophiæ*, no longer exist; among the remaining ones are those of Belcredi and Del Maino, which are each 169 ft. high. Its oldest church, and perhaps the oldest in Italy, is that of San Michele, which is first mentioned in 661 and was restored, 1863–76. The cathedral, containing some good paintings, was commenced in 1488, but was never finished. In a beautiful chapel attached to it are the ashes of St. Augustine, in a sarcophagus ornamented with 50 bassi-rilievi, 95 statues, and numerous grotesques. In the church of San Pietro in Ciel d'Auro are deposited the remains of the unfortunate Boëthius. The Certosa of Pavia, now secularized, the most splendid monastery in the world, lies five miles north of the city. It was founded in 1396, contains many beautiful paintings, and abounds in the richest ornamentation. It has an octagonal cupola, painted ultramarine, and enameled in gold. It was sacked by the French in 1796. Its church is in the form of a Latin cross, and is 249 ft. long, and 173 ft. wide. The university of Pavia is said to have been founded by Charlemagne in 774, and was one of the most famous seats of learning during the middle ages. Its efficiency was much in-

creased by Galeazzo Visconti, who bestowed many privileges upon it in the year 1396. It consists of numerous colleges, and attached to it are a library of 135,000 vols., a numismatic collection, anatomical, natural history, and other museums, a botanic garden, a school of the fine arts, etc. The university is attended by 1529 students and auditors. It has numbered among its professors Alciati, Fidelfo, Spallanzani, Volta, Scarpa, Foscolo, and Monti. The other chief edifices comprise private palaces, theater, gymnasium, etc. Pavia carries on a good trade in wine, rice, silk, and cheese, and manufactures machines, hats, organs, chemicals, etc. Pop. '94, 37,400.

Pavia, the ancient *Ticinum* (afterwards *Papia*, whence the modern name), was founded by the Ligurii; it was sacked by Brennus and by Hannibal, burned by the Huns, conquered by the Romans, and became a place of considerable importance at the end of the Roman empire. Then it came into the possession of the Goths and Lombards, and the kings of the latter made it the capital of the kingdom of Italy. It became independent in the 12th c., then, weakened by civil wars, it was conquered by the Visconti in 1359. Since that period, its history is merged in that of the conquerors of Lombardy. Here, in 1525, the French were defeated by the imperialists, and their king taken prisoner; but in 1527, and again in the following year, it was taken and laid waste by the French. It was stormed and pillaged by Napoleon in 1796, and came into the possession of Austria by the peace of 1814. Since 1859 it has been included within the kingdom of Italy.

PAVIA. See Horse-Chestnut.

PAVIE, Théodore Marie, 1811; b. at Angers; traveled at an early age in the United States, Central America, and Asia, where he mastered the Chinese language, Sanskrit, and other Asiatic languages; became a contributor to the *Revue des Deux Mondes* and the *Bulletin de la Société de Geographie*, and was professor of Sanskrit literature in the college of France, 1852–57. His most important work is the *San-koué-tchi*, a history of China in the 13th c., published, Paris, 1851, 2 vols. His works descriptive of his travels are numerous. His latest works are *Recits de Terre et de Mer*, 1860, and *Recits des Landes et des Grèves*, 1863.

PAVIL'ION, a portion of a building, under one roof, of a tent-like form, with the slope of the roof either straight or curved. This form is much used in France—the higher parts of the new buildings at the Louvre are good examples of pavilions. Pavilion roofs are sometimes called French roofs.

PAVLOGRAD', a t. of south Russia, in the government of Ekaterinoslav, and 57 m. e.n.e. of the town of that name, on the Voltcha, an affluent of the Dnieper. It was founded in 1780, during the reign of the empress Catharine II., and its first colonists were the Zaporogsky Cossacks. But in 1782 a great portion of the English garrison of fort Magon in Minorca, having been subdued by the Spaniards, and being forced by the terms of their capitulation to renounce the English service, obtained liberty from the empress Catharine to settle in Pavlograd. The garrison was composed chiefly of Corsicans. Pop. of the town, '92, 16,264.

PAVON'IDÆ, a name sometimes used to designate the family of gallinaceous birds more commonly called *phasianidæ* (q.v.), sometimes applied as a designation to a portion of that family separated from the rest on very slight grounds, the chief distinction being the greater expansion of the tail. See Peacock.

PAWCATUCK' RIVER is formed by the union of Charles and Wood rivers in Washington co., R. I., flows w. and then s.w., forming the boundary line between Westerly, R. I., and Stonington, Conn. It empties into Little Narragansett bay, and is navigable for several miles.

PAWHE'A, a t. in Guinea, Africa, consisting of a mere collection of huts, on the road from Dahomey to the coast; pop. 16,000.

PAWL, on shipboard, is a catch or hook to prevent the capstan from flying round backwards during a pause in the heaving. A similar catch is used in the common windlass.

PAWN'BROKING (Du. *pand*, Ger. *pfand*, Fr. *pan*, a pledge). The business of lending money on pawns or pledges appears to have been carried on in England by certain Italian merchants or bankers as early at least as the reign of Richard I. By the 12th of Edward I., a messuage was confirmed to these traders where Lombard-street now exists; the name being, according to Stow, derived from the Longobards who used to congregate there for business purposes. Subsequently, these merchant adventurers became known generally by the name of Lombardens. Their wealth became proverbial. Among the richest of them were the celebrated family of the Medici; from whose armorial bearings it is conjectured that the pawnbroking insignia of the three balls have been derived. The bankers of Lombard-street appear to have exercised a monopoly in pawnbroking until the reign of Elizabeth. The trade is first recognized in law by the act 1st James I. c. 21. In the perilous days of Charles I. the goldsmiths were very frequently chosen as the custodiers of plate and money; which circumstance seems to have suggested to them the profitable business of lending on pawns and discounting bills. From this time, the oppression and extortion often exercised by brokers has continued to attract much public attention and discussion; and an effort has been made, both in England and on the con-

tinent, to obviate the evil by the establishment of what are called Monts de Piété, the object of which is to advance small sums to the very poor at a moderate interest. See MONT DE PIÉTÉ. In England, after many abortive efforts, a Mont de Piété office was started in 1708; but in 1731 it came to a disastrous end. The bubble mania of 1824–25 gave rise to a similar scheme. In this instance upwards of £400,000 was subscribed; but the undertaking miscarried and the capital was lost. A similar fate attended the Irish Monts de Piété, of which there were eight in 1841. In 1848 they had all disappeared except one, which lingered to 1853; when it also expired. It would thus seem hopeless to attempt to establish a pawnbroking office in England on any other footing than an ordinary commercial one. The cause of failure will be found to lie, generally, in the great difficulty of conducting a commercial undertaking on charitable principles, with sufficient energy and ability to compete successfully with others originating in the ordinary motives which lead men to engage in trade.

It hardly admits of dispute that the pawn-shop, in its practical working, is an evil—necessary, it may be, but still an evil; and the having recourse to it is strongly to be discouraged. There are, doubtless, cases where men are driven to pawn their goods from causes which are not discreditable, and which do not render it certain that they are on the road to ruin; but such cases are rare exceptions to the general rule. Besides making borrowing too easy, and thus encouraging the fatal habit of anticipating income, the pawn-shop is, in nine cases out of ten, the door to the drinking-shop. Even where the one does not directly lead to the other, it generally does so in the end. That "borrowing dulls the edge of husbandry" applies with a force increasing in a geometrical ratio as we descend in the scale of society. Admitting, however, that with all its tendency to demoralize, pawnbroking is, in many cases, of value in tiding over unforeseen pecuniary difficulties, it is sufficient to say, that so long as improvidence prevails among large classes of society, and so long as even the most prudent are liable to unforseen accidents, the accommodation of the pawn-shop is to a certain extent a necessity, and like other demands of the public will continue to be supplied. Nor are those who supply this demand to blame, any more than the caterers for many other expenses which economists pronounce to be wasteful. The fault, where there is a fault, is in those who borrow, not in those who lend. The legislature, accordingly, instead of trying to put down pawnbroking, has wisely confined itself to putting it under stringent regulations so as to prevent as far as possible its abuses.

Pawnbrokers are restricted in their business as regards loans under £10, by the statute 35 and 36 Vict., c. 93, which repealed all the prior statutes, and defined new offenses, and it also extends to "leaving-shops." The statute requires them to take out a license (for which they pay £7 10*s*.), and keep exhibited outside their names and business, fixes the rate of interest, and makes it necessary that a table of interest should be put up in a conspicuous part of the shop, to keep books with correct entries of the name and place of abode of the owners of goods, etc. If the owner of goods has just cause to suspect that such goods have been pawned at a particular shop, the justices of the peace may grant a search warrant, and if found, the goods may be restored to the owners. Pawnbrokers are expressly prohibited from taking in pledge linen, apparel, or unfinished goods, intrusted to any person to wash, manufacture, make up, etc., and also any goods under circumstances which should have aroused their suspicions. Goods which have been in pledge for a year may be sold, and the pawnbroker may bid for them if done openly. If the duplicate is lost, the owner of the goods may obtain a fresh one on verifying the fact of his being the owner before a justice of the peace. If the money borrowed be tendered with interest within the year, the pawnbroker is bound to deliver them up, otherwise a justice of the peace may by order compel him to do so. The mode of selling forfeited goods is prescribed by the statute, for all pledges above 10*s*. to be by auction—the catalogues to contain the names of the pawnbrokers, and the month when the goods were pawned, and the number entered in the pawnbroker's books. The result of the sales is to be entered in the books of the pawnbroker and auctioneer, and the surplus is to be paid on request to the owner of the goods if claimed within three years. In the case of pledges below 10*s*., the pawnbroker becomes the absolute owner after 12 months. Pawnbrokers are not to take goods in pawn from persons under the influence of drink, or under the age of 12. In case of penalties imposed on pawnbrokers for offenses against the act, the complainant, if the party aggrieved, and then only, generally gets half. In case of fire the pawnbroker is liable to the owner for the value of the goods (after deducting the amount of loan and profit), and 25 per cent. on the amount of the loan; but this only if the claim be made within 12 months after the pawning.

The greatest pawnbroking establishment in the world is the Mont de Piété of Paris. It trades with borrowed capital, and with the profits of former years temporarily capitalized. Recent statistics are not at hand; but it has been reported to receive in one year 1,431,575 pledges, valued at $5,180,000, including renewals, and the average charge was about 15 per cent. per annum. Taking one of the largest offices in England out of London, we find that in one year it received 142,835 pledges, valued at £36,560, including renewals, and the average charge was 25 per cent. per annum. Various circumstances render the difference between the rates really much less than these figures indicate; still there is no doubt that the interest charged on small loans is lower at the Mont de Piété of Paris than in the pawnbroking offices in this country; but this con-

venience is limited by the fact of the French establishment taking no loans under 3 francs.

The statutes of the United States generally regulate this business very carefully. The usury laws do not apply to loans by pawnbrokers, and they charge a high rate of interest, fixed by statute. The laws on this point are, as a rule, modeled after the English statute, but vary from it in unimportant details. In N. Y., for example, the statute provides that no person shall act as a pawnbroker without a license as such; and such licenses can be granted only in cities whose charters of incorporation give them specially the right to issue such licenses. Pawnbrokers must return goods to the rightful owner, but can oblige him to give a bond to answer in damages, should the title prove to be in some other person.

PAWNEE', a co. in central Kansas, intersected in the s.e. by the Arkansas river, followed in its course by the Atchison, Topeka and Santa Fé railroad; 756 sq.m.; pop. '90, 5204, chiefly of American birth, with colored. It is drained by the Arkansas river and its affluent, Pawnee creek, on which is Fort Larned, a military post, 7 m. from Larned railroad station. Co. seat Larned.

PAWNEE', a co. in s.e. Nebraska, having the state line of Kansas for its s. boundary; 432 sq. m.; pop. in '90, 10,340, chiefly of American birth. It is intersected by the Chicago, Rock Island, and Pacific, and the Burlington Route railroads. It is drained by the Big Nemaha river, the South fork, and Turkey creek, affluents of the Missouri river. Its surface is hilly in some localities, containing extensive beds of bituminous coal, with a large proportion prairie and some woodland. Its soil is calcareous, and by the rivers a rich sandy loam, adapted to the production of all kinds of grain and stock-raising. Co. seat, Pawnee city.

PAWNEES', a tribe of Indians in Nebraska, about the Platte river and its affluents, and comprising the four tribes of Loups, Republican Pawnees, Grand Pawnees, and Tapage Pawnees. They are on Marquette's map in 1673. In the 18th c. numbers of them were slaves in Canada, where Pani became a synonym for any slave Indian. Then as now, they were always at war with the Sioux. They lived in lodges roofed with earth, raised small crops of maize and vegetables, and were in the habit of sacrificing prisoners to the sun as a means of securing large crops. Besides the Sioux, they fought the Sacs and Foxes, the Kiowas, and the Arapahoes. In 1832 the Delawares, who had settled in their vicinity, destroyed the village of the Great Pawnees on Republican fork. In 1833 the tribe ceded their lands s. of the Nebraska river. They remained on that portion of their territory n. of the Nebraska, and were prosperous for a time, devoting themselves to agriculture; and schools were established among them. An irruption of the Sioux broke up their settlements, and drove them s. of the Nebraska. This was contrary to their stipulations in the treaty of 1833, and in consequence they ceased to receive the annuity which that treaty secured to them from the United States. Their numbers, which had some years before been greatly reduced by small-pox, were now still further lessened by the cholera; and the Sioux continued to attack their settlements in spite of an additional treaty between the United States and the Pawnees in 1857. They furnished a contingent to the United States in the war with the Sioux in 1861. They are now under the management of the society of Friends, and are granted an annuity by the government, which maintains schools among them.

PAWTUCK'ET, a city in Providence co., R. I.; on both sides of the Pawtucket river and on the New York, New Haven, and Hartford, and the New York and New England railroads; 4 miles n. of Providence. It was settled in 1665; was selected by Samuel Slater as the site of the first cotton factory in the United States in 1790; and was chartered as a city in 1886. It has an area of over 8 sq. miles, national and savings banks, electric lights and street railroads, excellent waterworks, over 20 churches, numerous public and parochial schools, public library, public park, and extensive thread mills, print works, machine shops and foundries, and cotton, woolen, and hair cloth mills. Its manufactories use a capital of over $16,000,000, and have products valued at about the same amount. Pop. '90, 27,633.

PAX, called also PACIFICALE and OSCULATORIUM (Lat. *osculor*, I kiss), the "kiss of peace," and also a sacred utensil, employed in some of the solemn services of the Catholic church in the ceremony of giving the so-called "kiss of peace" during the mass. The practice of saluting each other—the men, men, and the women, women—during public worship, and particularly in the *agape*, or love-feast, is frequently alluded to by ancient writers, as Cyril of Jerusalem, Catech. xv., and St. Augustine, Serm. 227. All the ancient liturgies, without exception, refer to it as among the rites with which the eucharist was celebrated; but they differ as to the time and the place in the eucharistic service in which it is introduced. In the eastern liturgies it is before, in the western after the offertory (q.v.); and in the Roman it immediately precedes the communion. The ceremony commences with the celebrating bishop or priest, who salutes upon the cheek the deacon; and by him the salute is tendered to the other members, and to the first dignitary of the assistant clergy. Originally, the laity also were included, but this has long since been abandoned. It is when the mass is celebrated by a high dignitary that the utensil called the pax is used. The pax is sometimes a crucifix, sometimes a reliquary, sometimes a tablet with a figure sculptured or enameled upon it. Having

been kissed by the celebrant, and by him handed to the deacon, it is carried by the latter to the rest of the clergy. In ordinary cases the pax is given by merely bowing, and approaching the cheek to the person to whom it is communicated. The pax is omitted in the mass of Maundy-Thursday (q.v.), to express horror of the treacherous kiss of Judas.

PAXOS, the smallest of the Ionian islands, lies 10 m. s.w. of the coast of Albania, and 9 m. s.s.e. of the island of Corfu. It is about 5 m. long, and about 2 m. broad. The capital, or rather the chief village, is Port Gayo, on the e. coast. Produces fruits and olive oil, also goats and mules. The island is mountainous, and there is no drinkable water. Pop. with Antipaxos, 5,000.

PAXTON, JOHN R., D.D., b. Canonsburg, Penn., 1843; was educated at Jefferson coll., Penn., and at Princeton and Alleghany theol. seminaries. At the outbreak of the civil war he enlisted as a private in a Penn. regiment, and was mustered out as second lieut., 1865. He was pastor of the Pres. church, Churchville, Md., 1870–74; of the Pine st. church, Harrisburg, Penn., 1874–78; of the New York ave. church, Washington, D. C., 1878–82, whence he was called to the West Pres. church, New York, where he served till his resignation, 1893.

PAXTON, Sir JOSEPH, English architect and horticulturist, was b. at Milton-Bryant, near Woburn, Bedfordshire, in 1803. He was sent to Woburn free school, but left it at an early age, and obtained employment as a working gardener. He entered the service of the sixth duke of Devonshire, at Chiswick, and was thence transferred to Chatsworth, where he became the duke's chief gardener. His abilities as a horticulturist found ample scope in the beautiful gardens of Chatsworth, and are further attested by *Paxton's Magazine of Botany*, of which he was editor, as well as other works on plants and flowers. The experience he obtained in designing capacious glass conservatories at Chatsworth led him to propose a crystal palace of glass and iron for the great exhibition (q.v.) of 1851. It was the first time these materials had been employed on so extensive a scale, and visitors found an inexhaustible theme of admiration in a fairy palace so novel, beautiful, and magnificent. His design obtained for him great popularity and the honor of knighthood. The crystal palace of 1851 was removed from Hyde park, but became the germ of the nobler and more splendid palace at Sydenham, the construction of which he superintended; the grounds were also laid out by him. Crystal palaces for exhibitions of artistic and industrial objects have since 1851 been constructed at Dublin, New York, Paris, Manchester, etc. In 1854, Paxton was returned to parliament on the liberal interest for Coventry, which he represented for about 10 years. He was a member of many learned societies in Europe, and his works on horticulture and botany are much esteemed. He died in 1865.

PAY-MASTER (in GREAT BRITAIN).—Military pay-masters are either "control" or "regimental." Of the latter, who constitute by far the more numerous class, there is one to every brigade of artillery, regiment of cavalry, and battalion of infantry. The pay-master holds no other commission, but the appointment is nearly always conferred upon some person who has previously held a combatant rank in the army. The functions of pay-master comprise issuing and accounting for the pay of officers and men, and having charge generally of all the finances of the corps. In discipline, the pay-master is responsible to the officer commanding the regiment; but in all money matters he looks for orders to the war office alone. He commences with a pay of 12s. 6d. a day, with the relative rank of captain; and after 20 years' service attains the pay of £1, 2s. 6d. a day and relative rank as major. Regimental pay-masters were first appointed during the French war.

Control pay-masters have financial charge in the military districts or sub-districts. They form a separate department under the surveyor-general of the ordinance, comprising pay-masters, deputy pay-masters, and assistant pay-masters.

The NAVAL PAY-MASTER is for a ship what the military pay-master is for a regiment; but he adds to these duties some of those performed in the army by the quartermaster, commissariat, and military store-keeper, for he has charge of the provisions, clothing, and miscellaneous stores, as well as of mere money. Pay-masters are commissioned officers, receiving from 14s. to £1, 13s. a day, and ranking, according to service, with lieutenants, commanders, and captains. Up to the year 1844, pay-masters were styled pursers, and were paid by profits they made on certain of the ship's charges. At a still earlier period these pursers had been warrant-officers.

PAY-MASTER (in the UNITED STATES).—It is the duty of pay-masters in the United States army to pay all the regular and other troops in the service of the United States, making correct reports to the paymaster-general once in two months. When volunteers or militia are called into service, the president may assign to any officer of the army the duty of pay-master. Pay-masters are required to give bonds. In the navy the pay corps is the outgrowth of the old system of pursers, who were formerly civilians appointed for the cruise of a vessel only, whose duties were to supply all articles needed for the cruise and to pay all officers and men on board, and all bills incurred. The system was reorganized by congress, and the corps of pay-masters established, which now comprises 13 pay-directors, ranking with captains; 13 pay-inspectors, ranking with commanders; 50 pay-masters, ranking with lieutenant-commanders or lieutenants; 30 passed assistant pay-masters, ranking with lieutenants or masters; and 20 assistant pay-masters,

ranking with masters or ensigns. Pay-masters purchase all supplies, pay the officers and men, and have charge of all ship-stores, when at sea; and when on shore-duty are employed in the naval purchasing agencies, or have charge of provisions, clothing, and small stores in navy-yards. The senior pay-master of a fleet makes all purchases and distributes all funds to the pay-masters of the vessels of the fleet, being himself generally attached to the flag-ship.

PAYMASTER-GENERAL is an officer of the British ministry, but not of the cabinet, charged with superintending the issue of all moneys voted by parliament. He is virtually the pay-master of the public service, having no control over the sums issued, paying merely on the order of the department concerned; and receives £2,000 a year as chancellor of the duchy of Lancaster. He is always either a peer or a member of the house of commons, and changes with the ministry. Of late years the office has been held in conjunction with that of vice-president of the board of trade. The paymaster-general is assisted by a deputy and a staff of clerks, the annual cost of the whole department amounting to about £25,000.

PAYMENT, in law, the discharge in money of a sum due, or, in a more general sense, the fulfilling of any obligation assumed. In order to be effectual the payment must be made by one having a right to do it, must be in kind and quantity such as will satisfy the contract, must be made to the person legally entitled to receive it and at the time and place agreed upon or implied by law. Payment may be to an agent only when the latter is authorized to receive it, either specially or by general usage or implication of law. Thus if payment is made to the wife of a creditor it is not sufficient unless it be shown that she is allowed by the husband to collect debts and transact business for him. The payment must be made in money unless it be specially provided that goods are to be received or personal service accepted. So if an agent have authority in general to receive payment, and without special authority so to do, take goods, the creditor will not be bound by the agent's receipt. The U. S. constitution gives congress the power to declare what is a legal tender; that is what may be demanded and must be taken if offered. See MONEY. Subsidiary copper coins are not legal tender. The most usual evidence of payment is a receipt, but this is only *prima facie* evidence and may be overthrown by proof of non-payment either of a part or the whole. Where the sum is sent by mail, express, or messenger, if the debtor remit in compliance with the exact instructions of his creditor, the former is relieved from responsibility for loss. The giving of a check is not such a payment as will discharge a debt until the check has been cashed; and the drawer remains liable unless there have been gross negligence on the part of the holder. But where negotiable paper is given, the creditor may signify his acceptance of the transfer as good payment. A bill of exchange drawn on a third person, and by him accepted, discharges the drawer. Where two or more parties stand in the position of joint creditors, (as in a bank deposit) the payment should not be to one unless the debtor have the direct consent of the others. But there are exceptions in the case of partnership, executors, and trustees. Thus, if money be paid to a trustee and be misappropriated, the *cestui que trust* has no claim as against the original debtor. The compromise of a debt by accepting a partial payment in discharge of the whole debt was until recently considered as not being of effect, on the ground of want of consideration and to prevent the exertion of undue pressure or taking of advantage. But it is now fully established that if the compromise be untinged by fraud or undue influence, the discharge is complete. Payment of a part may go to the jury as evidence tending to show payment of the whole. The question as to whether there have been acceptance or not is one for the jury and depends on evidence of the intent of the parties at the time. It is now generally held that any act of a third party which is accepted by the creditor as payment will act as a discharge. Payment by or to an attorney is as good as though the principal had acted. As to the time of payment, courts of law hold strictly to the rule that it must be on the exact day agreed upon, but subsequent payment may in many cases be compelled by courts of equity. If no day be specified the payment must be on demand. Where payment has been made in bank notes which proved to be forged or counterfeit, there is no discharge of the obligation. Where the notes are not forged, but the bank of issue proves insolvent, the general rule is that the loss should fall on the payer, but if the bank were solvent at the time of acceptance, and the loss occurred through the unreasonable delay of the payee in presenting the bills, he must sustain the loss. As in the case of checks and negotiable paper, the question as to what is unreasonable delay must be determined by the court in view of the special features of each case. Payment of part of a debt bars the action of the statute of limitations. In England it has been held that money paid under a mistake of law cannot be recovered, but in this country a distinction is made between *ignorantia legis* and mistake. The rules for the appropriation of payments are important. Appropriation consists in the application of money paid to one or more of several debts due from the payer to the payee. There are three cases:—where the debtor applies, where the creditor applies, and where the appropriation is made by law. The debtor has the first right to say to which debt the payment shall apply, and if he neglect to do so, the creditor may exercise the same right; but the latter cannot so apply the money as to revive debts barred by the statute of limita-

tions. Where the payment is a forced one, as upon judgment and execution, the money must be applied *pro rata* upon all claims. When the appropriation is made by order of the court, it is usual to prefer the least secured debt, but in other respects the debtor is usually favored, as in applying money to a mortgage rather than to a contract debt.

PAYN, James, b. Cheltenham, Eng., 1830; graduated at Cambridge, 1854, and adopted literature as a profession. He published two youthful vols. of poems; contributed largely to periodicals; and in 1858 became editor of *Chambers's Journal*. His novel of *Lost Sir Massingberd*, which he contributed to that magazine, is said to have largely increased its circulation. Since then he has published numerous novels, the best known of which are *Cecil's Tryst*, *Fallen Fortunes*, *What he Cost Her*, *Less Black than We're Painted*, *By Proxy*, *A Grape from a Thorn*, *Gleams of Memory* (1894), *In Market Overt* (1895), etc. In 1882–96 he was editor of the *Cornhill Magazine*.

PAYNE, Henry B., b. Hamilton, N. Y., 1810; graduated at Hamilton coll., 1832, and began to practice law at Cleveland, O., 1834; served in the O. senate, 1849–50; was the dem. candidate for U. S. senator, 1851, and for gov. 1857. He was elected to the XLIVth congress by a fusion of democrats and liberal republicans. He was elected U. S. senator in 1884. He d. in 1896.

PAYNE, John Howard, 1792–1852; b. in New York. He showed great precocity, and at 13 years of age, while a clerk in a mercantile house in New York, secretly edited a weekly paper, *The Thespian Mirror*. In 1807 he issued 25 numbers of a periodical called *The Pastime*. He was at that time a student of Union college, but the bankruptcy of his father led to his departure from this institution before completing his collegiate course. Having evinced considerable dramatic ability, he decided to go on the stage, as the best means of supporting the family. He made his début at the Park Theatre, New York, Feb. 26, 1809, as "Young Norval." This enterprise proved an artistic and pecuniary success, and he subsequently appeared before large and enthusiastic audiences in Boston, Philadelphia, and Baltimore. In 1813 he sailed for England, and made his first appearance in London at Drury Lane theater as Master Payne, "the American Roscius," in his original part of Young Norval. His performances were well received by the public. After this he supported himself in England as actor, manager, and playwright, but owing to his lack of business ability was often in financial embarrassments. He adopted many plays from the French, and produced a number of original plays, including *Brutus*, *Thérèse*, *Virginius*, and *Charles II*. But it is as the author of *Home, Sweet Home*, (adapted to an old Sicilian melody) which occurs in his play *Clari, or the maid of Milan*, that Payne has acquired a lasting reputation. The publishers of this song are said to have cleared by it, for the benefit of Charles Kemble, the manager of the theater, 2,000 guineas within 2 years after its first publication; and by the year 1832 it was computed that more than 100,000 copies had been sold. In 1826–27, Payne edited in London a periodical, the *Opera Glass*, and returned to America in 1832. In 1841 he was appointed American consul at Tunis, Africa, recalled in 1845, and re-appointed in 1851. He died there April 10, 1852, and the United States government has erected a monument over his remains in the cemetery of St. George at Tunis. There is also a bust of him in Prospect Park, Brooklyn, erected through the efforts of his biographer, Gabriel Harrison, in connection with the Faust club of that city. In 1815 he published a selection of juvenile poems, *Lisping of the Muse;* of his fugitive writings the best known are a series of papers on *Our Neglected Poets;* and an account of East Hampton, published in the *Democratic Review*. In 1883 his remains were removed from Tunis to Washington.

PAYSON, Edward, d.d., 1783–1827; b. N. H.; graduated at Harvard college in 1803; was for three years teacher of an academy in Portland, Me.; then studied theology with his father, the Rev. Seth Payson, pastor at Rindge, N. H.; was ordained colleague of Mr. Kellogg, minister of the congregational church at Portland, in 1807, and in 1811 became the sole pastor, remaining there until his death. Several calls received from Boston and New York he declined. His labors were very successful, over 700 having been added to his church. He had great breadth of intellect, a rich imagination, familiar acquaintance with the Scriptures, and intense zeal in the work of the ministry. His complete works were published in 1859, in 3 vols., with a memoir by the Rev. Dr. Cummings.

PAYTA, a seaport of Peru, at the head of a very safe bay between cape Blanco and Sechura bay; lat. 5° 5′; connected by railway with Piura; pop. under 4,000.

PAZ (La) **DE AYACU′CHO**, a t. of Bolivia, South America, capital of a dep. of the same name, about 20 m. from the s. shore of lake Titicaca, is situated on the e. declivity of the Andes, at an elevation of 12,000 ft. above the sea, on both sides of a deep ravine, here crossed by nine bridges. The whole city is subdivided into sections by numerous ravines. The streets are generally irregular and steep; there are some good public buildings, several educational institutions, a noble cathedral, and many other churches. It is the seat of a bishop and a university. La Paz is the largest city and the principal commercial emporium of Bolivia—the exports consisting of bark, copper and alpaca wool; and the imports of manufactured goods, the bulk of which comes through Peru. This city, whose original name was Nuestra Señora de la Paz, was founded in 1548. The name was changed in 1825 to its present form, in

honor of the national victory of Ayacucho (q.v.). The population in 1892 was given as 45,007, the greater part of which was Indian.

PEA, *Pisum*, a genus of plants of the natural order *Leguminosæ*, suborder *Papilionaceæ*, closely allied to the genus *Lathyrus* (q.v.), from which it differs chiefly in the triangular style. Two species, supposed to be natives of the s. of Europe and of the east, are very extensively cultivated for their seeds (peas), which are the best of all kinds of pulse; the COMMON PEA or GARDEN PEA (*P. sativum*) in gardens, and the FIELD PEA (*P. arvense*) in fields; both of them climbing annuals, with pinnate leaves, ovate leaflets, and branching tendrils in place of a terminal leaflet; the garden pea distinguished by having two or several flowers on each flower-stalk, the flowers either red or white, more generally white, and the seeds subglobular; the field pea having one flower on each flower-stalk, the flowers always red, and the seeds angular from crowding and compression in the pod. But it is not improbable that they are truely one species, of which the garden pea has, through cultivation, departed furthest from the original type. Peas have been cultivated in the east from time immemorial, although the ancient Greeks and Romans do not seem to have been acquainted with this kind of pulse, the cultivation of which was apparently introduced into Europe very early in the middle ages; and its cultivation extends from warm climates, as India, even to the Arctic regions, the plant being of rapid growth and short life. The seeds of the garden pea are used for culinary purposes both in a green and in a ripe state; also the green succulent pods of some varieties, known as sugar peas or wyker peas, in which the membrane lining the inside of the pod—parchment-like in most kinds—is much attenuated. Field peas are used both for feeding cattle and for human food. For the latter purpose, peas are often prepared by being *shelled*, or deprived of the membrane which covers them, in a particular kind of mill; they are then sold as *split peas*, and are much in use for making *pea soup*. They are also ground into meal, which is used in various ways, chiefly for making a kind of pottage and of unleavened bread. In the countries bordering on the Mediterranean, peas are roasted in order to eat.

There are innumerable varieties both of the field pea and the garden pea, those of the latter being so much the products of horticultural art, that they cannot be preserved without the utmost attention. Some of the kinds of garden peas have long stems, and require for their support stakes of six or eight feet in height; others are of humbler growth; and certain dwarf kinds, preferred as most convenient in many gardens, succeed very well without stakes. The largest kinds are sown in rows about four feet asunder. In Britain, garden peas are sown at different times from February to June, in order to secure a supply of green peas during a considerable part of summer and autumn; and in the southern parts of the island they are also sown in the end of autumn, a very little protection being sufficient for them during the winter. Certain small kinds, of very rapid growth, known as *early peas*, are preferred for the first sowings, although less productive than many others. The varieties known as *mammoth peas* are remarkable for their size and tenderness in a green state, but shrivel as they ripen.

Branches of trees are generally used for pea-stakes, when they can be obtained, and nothing can be better; but in lieu of them, strings are sometimes stretched between poles along the rows. Field peas are sometimes sown alone, and allowed to support each other, where the soil is not very rich, but are very generally sown with beans, to which they cling.

Chalky and other calcareous soils are particularly suitable for peas, and in other soils a good field crop is seldom obtained unless the land has been well limed, or manured with gypsum. The free use of lime is supposed, however, to be unfavorable to the quality of garden peas intended to be used green.

Peas are cultivated to a considerable extent as a field crop in America, but are best adapted to those districts in which the climate in least moist, the seeds being very apt to grow in the pods when moist weather prevails in autumn, by which the crop is injured or destroyed. The most productive kinds, being also in general the most bulky in straw, are very apt to lodge before the pods are filled, in wet seasons, and particularly on rich land. The crop is therefore rather a precarious one.

The haulm or straw of peas is used for feeding cattle; and for its sake, field peas are often reaped before they are quite ripe, great care being taken in stacking the straw to provide for ventilation, so that it may not *heat*. Pea haulm is more nitrogenous and more nutritious than hay.

Land to be sown with field peas should be very *clean*, and in particular free of couch grass; otherwise the best management cannot prevent its becoming more foul whilst bearing the pea crop. The seed ought always to be sown in rows, twelve inches apart, or, in rich soils, eighteen or twenty inches apart. Various means are employed for sowing peas; they are not unfrequently plowed under each second furrow; but the seed ought not to be buried more than four inches under the surface, and indeed that depth is too great; although many farmers sow their peas deeper than they otherwise would, to place them beyond reach of wood pigeons. All possible means ought to be used to keep the land free of weeds. In some districts, peas are generally sown broadcast, which renders it impossible to do anything for this purpose. In the harvesting of peas, the sheaves are generally left loose till the haulm is somewhat dry. In drying, it shrinks

very much. Broadcast peas are often cut with the scythe, and the harvesting of them is managed much as that of hay.— *Winter field peas*, a variety with very small seeds, are much cultivated in France and Germany, being sown in October, enduring the severest frosts without injury, and ripening very early.

Besides being one of the most important agricultural and horticultural crops, peas are largely imported into Britain, the quantity sometimes reaching 120,000 quarters. They are shipped from Denmark, Prussia, the Hanse Towns, Holland, Morocco, United States, British North America; and of these, Denmark and the North American colonies send the greater part. As an article of food, if not taken too often or without other food, peas are very valuable, as they contain a large percentage of *casein*, which is a flesh-forming principle. This principle in the pea has been called *legumin*, but chemists are now generally agreed that it is identical with the casein of cheese. The following is an analysis of 100 parts of pea meal:

Water	14.1
Casein	23.4
Starch	37.0
Sugar	2.0
Gum	9.9
Fat	2.0
Woody fibre	10.0
Mineral matter	2.5
	100.0

The unripe peas of the garden varieties are amongst our most esteemed vegetables, and the meal of the white or yellow varieties used in soups is a highly nutritious and agreeable food.

A plant found on some parts of the shores of Britain, as well as of continental Europe and North America, and known as the SEA PEA, has been commonly referred to the genus *pisum*, and called *P. maritimum*, although botanists now generally refer it to *lathyrus*. It much resembles the common pea; has large reddish or purple flowers on many-flowered stalks; and its seeds have a disagreeable bitter taste. Its abundance on the sea coast at Orford, in England, is said to have saved many persons from death by famine in 1555. The other species of *pisum* are few. But the name pea is often given to species of other papilionaceous genera. The SWEET PEA and EVERLASTING PEA are species of *lathyrus*. The CHICK PEA (q.v.) is a species of *cicer*.

PEA BEETLE, or PEA CHAFER, *Bruchus pisi*, a coleopterous insect, very destructive to crops of peas in the s. of Europe and in North America. It is about a quarter of an inch long, black, variegated with bright brown hairs, and with white spots and dots on the wing-cases. It lays its eggs in the young pods, one for each pea, and the larva eats its way into the pea, and completely hollows it out. See illus., BUTTERFLIES, ETC., vol. III. p.

PEABODY, a town in Essex co., Mass.; on the Boston and Maine railroad; 2 miles e. of Salem. It contains West Peabody, South Peabody, North Peabody, and several other villages, and has electric railroad communication with Lynn, Salem, and Danvers, national and savings banks, high school, the Peabody institute with library, Sutton reference library, and manufactories of morocco, leather, sheepskin, boots and shoes, electric supplies, wool, thermometers, etc. The town was formerly South Danvers; name changed in honor of George Peabody in 1868. Pop. '90, 10,158.

PEABODY, ANDREW PRESTON, D.D., LL.D., b. Mass., 1811; graduated at Harvard college in 1826, and was tutor in mathematics there. In 1833 he was settled over a Unitarian church in Portsmouth, N. H., where he remained till 1860, when he became Plummer professor of Christian morals in, and chaplain of Harvard university, which position he resigned in 1881. He edited the *North American Review*, 1854–63. Among his numerous works are *Lectures on Christian Doctrine* (1844); *Moral Philosophy* (1873); *Christianity and Science* (1874); *Christian Belief and Life* (1875). As a thinker, preacher, and writer, standing firm in the Christian faith, with abounding charity, presenting careful thought with natural rhetorical grace, he won esteem from men of various theological opinions; while, as the pastor in the university, his influence was beneficent over successive classes of students. He d. in 1893.

PEABODY, ELIZABETH PALMER, b. Mass., 1804; educated in Salem, and in 1820 became a teacher in Boston. She was one of the first to introduce object-teaching into schools, and through life did much to spread kindergartens and the views of Froebel in the United States. She published many works of an educational character, particularly on kindergarten work. She d. in 1894.

PEABODY, EPHRAIM, D.D., 1807–53; b. N. H.; educated at Bowdoin college, and studied theology at the Harvard divinity school. He was settled over a Unitarian church in New Bedford, 1838–46, when he became pastor of King's chapel, Boston, where he remained till his death. He was the founder of the Boston Providence society. A selection from his writings was published in 1858 under the title of *Christian Days and Thoughts*.

PEABODY, GEORGE, an American merchant whose name deserves to be held in remembrance on account of his munificent philanthropy, was b. at Danvers, Mass., Feb. 18, 1795. His parents were poor, and his only education was received at the district school. At the age of 11 he was placed with a grocer, and at 15 in a haberdasher's shop in Newburyport. When 22 years old, he was a partner with Elisha Riggs in Baltimore. In 1827 he first visited England, where he settled permanently ten years later. Withdrawing from the Baltimore firm in 1843, he established himself in London as a merchant and money-broker, and accumulated a large fortune. As one of three commissioners appointed in 1848 by the state of Maryland to obtain the restoration of its credit, he refused all payment, and received a special vote of thanks from the legislature of that state. In 1851 he supplied the sum required to fit up the American department at the great exhibition. In the following year he sent a large donation, afterwards increased to $270,000, to found an educational institute, etc., in his native town of South Danvers (now called Peabody). He contributed $10,000 to the first Grinnell Arctic expedition; $1,400,000 to the city of Baltimore for an institute of science, literature, and the fine arts; $8,000,000 for the promotion of education, endowment of libraries, etc., in the United States. From 1862 to 1868, he gave £350,000 for the benefit of the London poor, and in his will he left £150,000 for the same purpose; half a million in all, which has been employed in building dwellings for the working-classes. He died in London in 1869. See PEABODY EDUCATIONAL FUND.

PEABODY EDUCATIONAL FUND. In 1867 the eminent philanthropist George Peabody (q.v.) made a gift of $1,000,000, with $1,100,000 Mississippi state bonds, to be dispensed by them for promotion of "intellectual, moral, or industrial education in the most destitute portions of the southern states," its object being not so much to create new schools as to strengthen or resuscitate old ones. In 1869 Mr. Peabody contributed another million dollars and $384,000 Florida bonds. The trustees (a corporate body) had authority to expend 40 per cent. of the principal during the first two years, after which the amount was to remain unchanged for thirty years, when they might close the fund, giving not less than ⅔ for educational purposes and the remainder for literary.

The rules guiding the action of the trustees may be summarized thus: 1. Schools aided must have at least 100 pupils, with a teacher for every 50, be graded, and open 10 months yearly. 2. Trustees to act in unison with state authorities, and co-operate with school superintendents. 3. The largest sum allowed to a school of 100 pupils to be $300; of 200, $600; of 300, $1000. 4. Every grant to be made on condition of the district paying twice as much. 5. Limited aid to normal schools by grants and scholarships for training teachers.

PEABODY, NATHANIEL, 1741–1823, b. Mass.; studied medicine with his father, practiced for some years at Leominster, Mass.; and in 1761 moved to Plaiston, N. H., where he soon obtained a large practice. In 1774 he resigned the commission of lieut. col. of militia which he held from the king, and the same year assisted in the capture of fort William and Mary. He was afterwards a member of the legislature, and, as chairman of the committee of safety, delegate to the New Haven convention of 1779, and state adjutant-general he rendered valuable services to the revolutionary cause. In 1779 he was a delegate to congress and, 1780–98, filled many positions of honor, such as member of the legislature, senator, speaker of the house, and major-general. He was one of the founders of the state medical society of New Hampshire. Toward the end of his life he was confined several years in prison for debt.

PEABODY, OLIVER WILLIAM BOURN, 1799–1848; b. N. H.; twin brother of William O. B.; graduated at Harvard in 1816, read law at the Harvard law school, and practiced at Exeter, N. H., 1819–30, which town he represented in the state legislature. He settled in Boston in 1830, was associated with Alexander H. Everett in the editorship of the *North American Review*, and was an editor of the *Advertiser*. He was register of probate for Suffolk co., 1836–42, when he became professor of English literature in Jefferson college, Louisiana. He studied theology, and in 1845 was settled over the Unitarian church in Burlington, Vermont. He published an edition of Shakespeare, 1844, and wrote the lives of Gens. Putnam and Sullivan for Sparks's *American Biographies*.

PEABODY, SELIM HOBART, PH.D., LL.D., b. Vt., 1829; graduated at the univ. of Vermont, 1852; became professor of mathematics and civil engineering in the polytechnic college of Pennsylvania, at Philadelphia, 1854; principal of high school at Fond du Lac, Wis., 1859; superintendent of schools, Racine, Wis., 1862; professor of physics, Chicago high school, 1865; of physics and civil engineering, Massachusetts Agricultural college, at Amherst, 1871; of mechanical engineering and physics, in the university of Illinois, at Urbana, 1878; literary editor, American Book Exchange, New York, 1880; from which in the same year he was called to the presidency of the Illinois university, a position which he resigned in 1892 to assume a directorship on the World's Fair Committee. Among his published writings are: *Elements of Astronomy; New Practical Arithmetic;* and *Cecil's Books of Natural History.*

PEABODY, WILLIAM BOURN OLIVER, D.D., 1799–1847, b. N. H.; educated at Harvard, and from 1820 till his death settled over the Third Congregational church (Unitarian) in Springfield, Mass. His *Literary Remains* were published in 1850. He was of a nature gentle yet strong, with poetic sensibilities, fine literary taste and spiritual fervor.

The well-known hymn, "Behold the western evening light," is a specimen of his verse. His sentiments were evangelical.

PEACE RIVER, in the northwest territories of Canada, rising in about lat. 50° n., flowing n. and n.e. for about 1000 m. into Great Slave lake. It is navigable for the greater part of its course, and from near lake Athabasca to its mouth is known as Slave river.

PEACE, OFFENSES AGAINST THE PUBLIC, are those offenses which consist in either actually breaking the peace or constructively doing so by leading directly to a breach. These offenses are now usually known under the heads of unlawful assemblies, seditious libels and slanders, riots, affrays, challenges to fight, forcible entry and detainer, and libel and slander. Those who take part in an unlawful assembly commit a misdemeanor against the public safety. All persons assembled to sow sedition, and bring into contempt the constitution, are in an unlawful assembly. Thus it was held that an attempt to hold a national convention was illegal, for it was impossible to anticipate with certainty the peaceful result of such a meeting. It is, however, somewhat difficult to define precisely what amounts to an illegal assembly, except by saying that it points to some course inconsistent with the orderly administration of the laws. It is the duty of all individual citizens to resist and oppose any unlawful assembly; but the duty rests primarily with the magistrates of the district, who are indictable for breach of duty in not taking active and immediate steps to put down riots. Thus the mayor of Bristol was indicted for not suppressing the riots at the time of the Reform bill. The magistrates ought to call at once upon special constables to be sworn in, and if these are insufficient, to call for the aid of the military. Seditious libels are also offenses against the peace, as inciting directly to a breach. Such are libels vilifying the sovereign or the houses of parliament, or the courts of justice, or even a foreign sovereign, as in the case of Peltier, who was tried for a libel against the emperor Napoleon I., the tendency of such a libel being to breed misunderstanding between our own sovereign and the foreign sovereign. A riot is the most active form of an offense against the public peace. To constitute a riot, there must be at least three persons engaged together in pursuance of an illegal purpose. Riots often originate in an attempt to redress summarily some private wrong. On such an occasion, before extreme measures are resorted to, and as a test of the good faith of those who are spectators, instead of parties, and by way of full notice to all concerned, the justices of the peace may read the riot act, 1 Geo. I. st. 2, c. 5, which commands all persons to disperse within one hour after a proclamation is read, otherwise they will be guilty of felony. Persons not removing within one hour thereafter may be arrested, and carried before a justice, and committed to prison. It is, however, possible that the justices may make a mistake in thinking that to be an illegal assembly which is not so, for the mere reading of the riot act does not alter the character of the assembly, and accordingly if the party arrested prove at the trial that it was no illegal assembly he will be discharged. An affray is also an offense against the public peace, being a public assault, i.e., an assault committed in presence of third parties, for this is apt to lead to further breaches of the peace by others joining in it. Thus prize-fights and duels are affrays, and all present at them are principal offenders, and may be arrested by a constable and bound over to keep the peace, and punished by fine and imprisonment besides. So challenges to fight, provocations to fight, and forcibly entering into a house, are misdemeanors against the public peace. The laws in the U. S. on this subject are identical with those of England.

PEACH, *Amygdalus Persica*, a tree much cultivated in temperate climates for its fruit; a native of Persia and the n. of India; of the same genus with the almond (q.v.), and distinguished by oblongo-lanceolate serrulate leaves; solitary flowers, of a delicate pink color, appearing before the leaves; and the sarcocarp of the drupe succulent and tender, not fibrous as in the almond. This difference in the drupe has been made by some the ground of a generic distinction, but there are intermediate states, so that others have doubted if the peach and almond are even specifically distinct. The nectarine differs from the peach only in having a smooth fruit, whilst that of the peach is downy or velvety, and is a mere variety, probably produced and certainly preserved by cultivation. Both peaches and nectarines are divided into *freestones* and *clingstones*. In the former the flesh of the fruit parts from the stone; in the latter it adheres to it. The freestone peach is the *pêche* of the French, the clingstone peach their *pavie*, the freestone nectarine they call *pêche lisse*, and the clingstone nectarine *brugnon*. Of all these there are many subvarieties, the finer ones being perpetuated by budding; which in Britain is generally on plum or almond stocks. There is a remarkable variety of Chinese origin, with the fruit compressed and flattened, and with almost evergreen leaves. The peach is much cultivated in the s. of Europe, in many parts of the east, in the warmer temperate parts of North and South America, in Australia, etc., as a standard tree; in general, it is rather a small tree with a full head; in Britain, it is generally trained on walls, and in the northern parts of it on flued walls or in hot houses, although even in Scotland excellent peaches are ripened on open walls without artificial heat. The nectarine is rather more tender than the peach. In the extensive peach orchards of New Jersey, Pennsylvania, Maryland, and other states of North America, which sometimes contain 10,000 or 20,000 trees, the fruit is often of very inferior quality, from want of care in cultivation—the orchards being planted by simply depositing the

seed in the ground; and much of the fruit is used for making a spirituous liquor called *peach brandy*; much of it is dried in ovens, or in drying-houses furnished with stoves, or, in the more southern states, in the sun, each fruit being divided into two parts, and the stone taken out, and when dried it is sent to market to be used for pies; the refuse of the orchards is used for feeding swine. The peach is a very pleasant and refreshing fruit, and in a stewed form is useful in slight cases of constipation. The leaves, when fresh, have the smell and taste of bitter almonds; and by bruising them, mixing the pulp with water, and distilling, the *peach water* is obtained which is so much esteemed by many for flavoring articles of cookery. They have been employed as a sedative and as a vermifuge. The seeds almost entirely agree in their properties with bitter almonds; the flowers exhale an odor of bitter almonds; and both seeds and flowers are employed in the manufacture of a liqueur called *persico*.

PEACH-WOOD, or LIMA-WOOD, a dye-wood imported from South America, supposed to be the produce of a species of cæsalpinia, allied to that which yields the Nicaragua wood. It yields a fine peach color, whence its name, and is now much used in muslin and calico printing and dyeing. See BRAZIL-WOOD.

PEACOCK, or PEAFOWL, *Pavo*, a genus of gallinaceous birds of the family *pavonidæ*, or *phasianidæ*, of which only two species are known, natives of the East Indies; birds of large size, and remarkable for magnificence of plumage. The bill is of moderate size, somewhat arched towards the tip; the cheeks nearly naked; the head crested; the tarsi rather long, and armed with a single spur; the wings short; the upper tail-coverts prolonged far beyond the tail, and forming a splendid train—popularly called the *tail*—which is capable of being erected and spread out into a great disk, the true tail being at the same time erected to support it. The common peacock (*P. cristatus*) has for crest a kind of aigrette of 24 upright feathers, with slender almost naked shafts and broad tip. The tail consists of 18 brown stiff feathers, and is about 6 in. long. The train derives much of its beauty from the loose barbs of its feathers, whilst their great number and unequal length contribute to its gorgeousness, the upper feathers being successively shorter, so that when it is erected into a disk, the eye-like or moon-like spot at the tip of each feather is displayed. The lowest and longest feathers of the train do not terminate in such spots, but in spreading barbs, which encircle the erected disk. The blue of the neck, the green and black of the back and wings; the brown, green, violet, and gold of the tail; the arrangement of the colors, their metallic splendor, and the play of color in changing lights, render the male peacock an object of universal admiration—a sentiment in which the bird himself evidently participates to a degree that is very amusing, as he struts about to display himself to advantage, and labors to attract attention, affording a familiar proverbial image of ostentation and pride. When the disk is erected, the peacock has the power of rattling the shafts of its feathers against each other in a very peculiar manner, by a strong muscular vibration. The peahen is much smaller than the male bird, has no train, and is of dull plumage, mostly brownish, except that the neck is green. As in some other gallinaceous birds, the female has been known, in old age, to assume the plumage of the male. Individuals with white plumage not unfrequently occur, in which even the eye-like spots of the tail are but faintly indicated; and pied peacocks, having the deep blue of the neck and breast contrasted with pure white, are sometimes to be seen. The peacock is generally supposed to have been known to the Hebrews in the time of Solomon, but it is not certain that the word commonly translated *peacocks* in the account of Solomon's importations from Tarshish (2d Chron. ix. 21) does not signify *parrots*. It is commonly stated that it first became known to the Greeks on the occasion of Alexander's expedition to India, but Aristophanes mentions it in plays written before Alexander was born. The peacock became common among the Greeks and Romans; a sumptuous banquet in the latter days of Roman greatness was scarcely complete without it; and wealth and folly went to the excess of providing dishes of peacocks' tongues and peacocks' brains. Throughout the middle ages, also, a peacock was often presented at the tables of the great, on great occasions, the skin with the plumage being placed around the bird after it was cooked. The peacock is now common in most parts of the world; generally kept, however, except in warm countries, for ornament rather than for profit, although both the flesh and the eggs are very good. It readily partakes of all the ordinary food provided for the poultry-yard, and is fond of buds and succulent vegetables. It is hardy enough even in cold climates, except that few eggs are laid, and the young are difficult to rear, but the adult birds sit on trees or on the tops of houses, stacks, etc., during the keenest frosty nights, never, if they can avoid it, submitting to the confinement of a roosting-place, like that of the common fowl. Peacocks are found in almost all parts of India, Siam, etc., and the multitudes in which they occur in some districts are wonderful. "About the passes in the Jungletery district," col. Williamson says, in his *Oriental Field Sports*, "whole woods were covered with their beautiful plumage, to which a rising sun imparted additional brilliancy. The small patches of plain, among the long grass, most of them cultivated, and with mustard then in bloom, which induced the birds to feed, increased the beauty of the scene; and I speak within bounds when I assert that there could not be less than 1,200 or 1,500 peafowls, of various sizes, within sight of the spot where I stood for near an hour." Sir James Emerson Tennent, also, in his work on Ceylon, says that "in some of the unfrequented por-

tions of the eastern province, to which Europeans rarely resort, and where the peafowl are unmolested by the natives, their number is so extraordinary that, regarded as game, it ceases to be 'sport' to destroy them; and their cries at early morning are so tumultuous and incessant as to banish sleep, and amount to an actual inconvenience."—The harsh cry of the peacock seems to have been imitated in its Greek name *Taōs*, and probably has given rise also to the Latin *pavo* and the English *pea*-cock. The peacock, in a wild state, also roosts on trees, but makes its nest on the ground. When alarmed, as it feeds on the ground, it cannot readily take wing, and is sometimes run down by dogs or by horsemen.—The other species of the peacock is the JAPAN PEACOCK or JAVANESE PEACOCK (*P. Japonensis*, *Javanicus*, or *muticus*), a native of some of the south-eastern parts of Asia and neighboring islands. It is nearly equal in size to the common peacock, but of less brilliant although very similar plumage. The cheeks and around the eyes are yellow; the neck, and other fore parts, greenish with golden reflections. The crest is longer than that of the common peacock, its feathers less equal, and webbed along their whole length. See illus., FOWL, ETC., vol. VI.

PEACOCK, THOMAS LOVE, 1785–1866; b. England; from 1818–56 connected with the East India office, and in the last year was retired on a pension. He was a man of scholarly attainments, a friend of Charles Lamb and Shelley, and the executor of the latter. He published a number of poems, novels, and tales. Of the first *Palmyra* and *Rhododaphne* were the most noted. Of his stories, the first published, *Headlong Hall*, is usually considered the best. His works were published in 1875, in 3 vols., with a biographical sketch.

PEACOCK-STONE, the name under which the dry cartilaginous ligaments of some large lamellibranchiate mollusks, as the pearl oyster, are sold by jewelers. They are used for ornamental purposes, although not so much as formerly; and far more on the continent of Europe, particularly in Portugal, than elsewhere. They have opaline reflections, and are therefore sometimes called *black opal*.

PEA CRAB, *Pinnotheres*, a genus of brachyourous crustaceans, with nearly circular and not very hard carapace. They are of small size, and interesting from their living within the mantle-lobes of lamellibranchiate mollusks, a circumstance which was well known to the ancients, and gave rise to many curious fables. A species (*P. veterum*) is very common in the *pinnæ* of the Mediterranean, and was imagined to render important services to its host in return for its lodging, keeping a lookout for approaching dangers, against which the blind pinna itself could not guard, and particularly apprising it, that it might close its shell when the cuttle-fish came near. It is curious to find this repeated by Hasselquist, in the middle of last century, as a piece of genuine natural history. Whether the pea crab lives at the expense of the mollusk, and sucks its juices, is uncertain. It is certain that the flesh of such mollusks is palatable to pea crabs, and they eat it greedily in the aquarium. The friendship of the pea crab and the pinna is of course as fabulous as that of the lion and jackal, or of the rattlesnake, the owl, and the prairie-dog. A species of pea crab (*P. pisum*) is very common within the mantle-lobes of the common mussel on the British coasts. Species are found in almost all parts of the world.

PEALE, CHARLES WILLSON, 1741–1827, b. Md.; apprenticed to a saddler, but at the age of 26 took lessons in painting from Heselius and Copley. He afterward studied a year under Benjamin West; and returning, opened a studio in Philadelphia, and for 15 years was the only professional portrait painter in the country, one of his first productions being a picture of Washington in the uniform of a colonel in the Virginia militia. He rendered valuable services to the revolutionary cause, and painted many portraits of prominent officers. Probably no man ever had more versatile acquirements than Mr. Peale. Before his art studies, he was a saddler, harness-maker, carver, watch-maker, and silversmith. After he had learned his profession, he amused himself by becoming a naturalist, sportsman, inventor of machinery, preserver of animals, maker of musical instruments, dentist, and inventor of enamel teeth. He also established a museum, lectured on natural history, and published essays on *Wooden Bridges*, *Domestic Happiness*, and many other topics. He was one of the founders of the American academy of fine arts.

PEALE, REMBRANDT, 1778–1860; b. Penn.; at an early age showed much skill in drawing, and when but 17 produced a portrait of Washington. From 1796 to 1801, he was a portrait painter in Charleston, S. C., and then studied for three years in London, under Benjamin West, and afterwards spent some time in Paris. In 1809 he returned to America, settled in Philadelphia, painted many portraits, and two other pictures, the "Roman Daughter," and "The Court of Death;" the latter of which was exhibited throughout the country, increasing the artist's fame and possessions. Among Mr. Peale's published works were *Notes on Italy*, 1831; *Biography of C. W. Peale* (his father); and *Reminiscences on Art and Artists*.

PEA MAGGOT, the caterpillar of a small moth (*Tortrix* or *Grapholitha pisi*), which lays its eggs in young pods of peas. The caterpillar lives in the pods and eats the peas. This moth is very common in America, and in wet seasons the pods of peas are often found very full of its caterpillar.

PE'AN, (old Fr., *pannes*, furs), one of the furs borne in heraldry, differing from ermine only in the tinctures; the ground being sable, and the spots of gold.

PEA ORE, a form of compact brown iron ore (hydrated peroxide of iron), consisting of round smooth grains, from the size of mustard-seed to that of small pease. Sometimes the grains are still smaller and flattish. This iron ore is very abundant in some places in France, and is smelted.

PEANUT. See ARACHIS, EARTH-NUT.

PEAR *Pyrus communis*, a tree of the same genus with the apple (see PYRUS), and like it one of the most extensively cultivated and valuable fruit-trees of temperate climates. The leaves are ovate, serrated, smooth on both surfaces, and without glands; the flowers are produced in corymbs, which may almost be called umbels, and are smaller than those of the apple; the styles are distinct, and not combined at the base, as in the apple; and the fruit is hemispherical at one end, tapering gradually away, more or less rapidly, to a point at the other. The pear-tree grows wild in woods and copses in Britain, on the continent of Europe, and throughout the temperate parts of Asia. In its wild state it is usually either a large shrub or a small tree, thorny, and with small austere fruit. In cultivation it is without thorns, becomes a tree of 40 or 50 feet high, sometimes more; and its stem attains a diameter of three feet. Cultivation has wrought even greater changes in the size and quality of its fruit. The pear has been cultivated from remote antiquity. Its cultivation was probably introduced into Britain by the Romans. The cultivated varieties are extremely numerous; and many new ones of great excellence have recently been produced. The *jargonelle pear* may be mentioned as one of the most esteemed of the varieties long known in Britain. Some of the kinds called *bergamot* and *beurré* are highly esteemed. Many new kinds have recently been introduced into Britain from France and Belgium. The varieties of pear differ much in hardiness and in fitness for particular soils; although a deep, moderately strong, dry, loamy soil is the best for this fruit. The finer varieties are cultivated in Britain as wall-trees. Pears succeed well as espaliers. They are generally grafted on seedling stocks of the wild pear, but sometimes on the rowan, and sometimes on the quince. Pears grafted on quince stocks are the best for shallow soils. The flowers and fruit of the pear are mostly produced on spurs, which spring from branches of more than one year old. Various modes of training and pruning are practiced for pear-trees, Among the varieties of pears are some which ripen early in autumn, and some which do not ripen till the beginning of winter, and which even require to be mellowed by keeping for a short time; whilst some of the kinds cannot easily be kept for more than a few days. In general, pears cannot be kept so long nor so easily as apples. Pears are sometimes made into a preserve with syrup; and sometimes cut into pieces, and dried in the sun or in an oven, to be afterwards used in pies, a practice very prevalent in France.—A very agreeable fermented liquor called *perry* is made from pears, in the same manner as cider from apples; and pear orchards for this purpose are to be seen in some parts of England, especially in Worcestershire and Herefordshire. The varieties of pear cultivated for making perry are all rather austere, and those which yield the best perry are far too austere to be palatable.—The wood of pear-tree is reddish, very hard, fine-grained, and valuable to turners and joiners. It is often dyed black in imitation of ebony, which it then greaty resembles.

Besides the varieties of pear usually referred to *pyrus communis*, some are occasionally cultivated which are generally regarded as distinct species. Such are the AURELIAN PEAR (*P. Salvifolia*), a native of France, with leaves much narrower than the common pear, and a long fruit, which is used for making perry; the SNOWY PEAR (*P. nivalis*), a native of the Alps of Austria, with oval obtuse leaves, white and silky beneath, and a globose fruit, which is very acid till it becomes quite ripe, or is beginning to decay, when it is very sweet; the SAND PEAR (*P. Sinensis*), a native of China and Cochin-China, with heart-shaped, shining, almost evergreen leaves, and apple-shaped warted fruit, very gritty, and fit only for baking, cultivated in gardens in India, but hardy in Britain. The PASHIA. (*P. pashia* or *P. variolosa*), is a native of the Himalaya; the fruit of which is only edible when bletted or partially decayed. The PALTOO (*P. lanata*) is another Himalayan species with edible fruit.

PEAR, PRICKLY. See PRICKLY PEAR.

PEARL, a peculiar product of certain marine and fresh water mollusks or shell-fish. Most of the molluscous animals which are aquatic and reside in shells are provided with a fluid secretion with which they line their shells, and give to the otherwise harsh granular material, of which the shell is formed, a beautifully smooth surface, which prevents any unpleasant friction upon the extremely tender body of the animal. This secretion is evidently laid in extremely thin semi-transparent films, which, in consequence of such an arrangement, have generally a beautiful iridescence, and form in some species a sufficient thickness to be cut into useful and ornamental articles. The material itself in its hardened condition is called *nacre* by zoologists, and by dealers, mother-of-pearl (q.v.). Besides the pearly lining of the shells, detached or generally spherical or rounded portions of the nacre are often found on opening the shells, and there is great reason to suppose these are the result of accidental causes, such as the intrusion of a grain of sand or

other substance, which by irritating the tender body of the animal, obliges it in self-defense to cover the cause of offense, which it has no power to remove; and as the secretion goes on regularly to supply the growth and wear of the shell, the included body constantly gets its share, and thereby continues to increase in size until it becomes a pearl. The Chinese avail themselves of the knowledge of this fact to compel one species of fresh water mussel, *unio hyria*, to produce pearls. In order to do this, they keep the unios in tanks, and insert between the shell and the mantle of the animal either small leaden shot or little spherical pieces of mother-of-pearl. These are sure to receive regular coatings of the nacreous secretion; and after a time look like pearls formed under ordinary circumstances. These curious people also practice another trick upon these animals; they insert small images of the Buddha stamped out of metal, which soon become coated with the pearl secretion, and are cemented by it to the shells; to those ignorant of its origin, the phenomenon is a supernatural testimony to the truth of Buddhism. Examples of these curosities are to be found in many of our museums.

A plan of making pearls was suggested to the Swedish government by Linnæus. It consisted in boring a small hole through the shell of the river mussel, and inserting a grain of sand, so as to afford a nucleus for a pearl. The plan at first succeeded sufficiently well to prove its practicability, and he was rewarded by a sum of money (£450), but it failed as a profitable speculation, and was abandoned.

The exact nature of the secretion has never been satisfactorily determined; it is, however, ascertained that it is deposited in thin films, which overlie each other so irregularly that when magnified they present the appearance of sharply serrated edges, and to this peculiar disposition of the plates, the beautiful iridescence of common pearls is attributed. Their formation was a great puzzle to the ancients, amongst whom they were very highly prized. Dioscorides and Pliny mention the belief that they were drops of dew or rain which fell into the shells when opened by the animal, and were then altered by some power of the animal into pearls. This opinion, which obtained all over the east, is thus charmingly alluded to by Moore:

> "And precious the tear as that rain from the sky,
> Which turns into pearls as it falls in the sea."

The most famous pearls are those from the east; the coast of Ceylon, or Taprobane, as it is called by the Greeks, having from the earliest times been the chief locality for pearl fishing. They are, however, obtained now of nearly the same quality in other parts of the world, as Panama in South America, St. Margarita in the West Indies, the Coromandel coast, the shores of the Sooloo islands, the Bahrein islands, and the islands of Karak and Corgo in the Persian gulf. The pearls of the Bahrein fishery are said to be even finer than those of Ceylon, and they form an important part of the trade of Bassora. These, and indeed all the foreign pearls used in jewelry, are produced by the pearl oyster (q.v.). The shells of the mollusks which yield the Ceylon, Indian and Persian ones, are sometimes as much as a foot in diameter, and are usually about nine inches. Those of the new world, although the shells are smaller and thicker, are believed to be the same species. The chief locality of the Ceylon pearl fishery is a bank about 20 m. long, 10 or 12 m. from shore, opposite to the villages of Condatchy and Arippo on the northern coast. The season of the fishery lasts about three months, commencing at the beginning of February, and is carried on under government regulations. The boats employed are open, and vary in size from 10 to 15 tons burden; they put out at night, usually at 10 o'clock, on a signal gun being fired from the fort of Arippo, and make for the government guard-vessel, which is moored along the bank, and serves the double purpose of a guard and a light-ship. The divers are under the direction of a manager, who is called the adapanaar, and they are chiefly Tamils and Moors from India. For each diver there is provided a diving-stone, weighing about 30 pounds, which is fastened to the end of a rope long enough to reach the bottom, and having a loop made for the man's foot; and in addition to this, a large net-work basket, in which to place the pearl oysters as he collects them. These are hung over the sides of the boat; and the diver, placing his foot in the loop attached to the stone, liberates the coils of the rope, and with his net-basket rapidly descends to the bottom. To each boat there is usually allotted a crew of 13 men and 10 divers, five of whom are descending while the others are resting. This work is done very rapidly; for, notwithstanding the stories to the contrary, the best divers cannot remain longer than 80 seconds below, and few are able to exceed 60. The greatest depth they descend is 13 fathoms, and usual depth about 9 fathoms. When the diver gives the signal by pulling the rope, he is quickly hauled up with his net and its contents. Accidents rarely happen; and as the men are very superstitious, their safety is attributed to the incantations of their shark-charmers, performed at the commencement of the fishing. Sir E. Tennent, however, attributes the rarity of accidents from sharks, usually so abundant in tropical seas, to the bustle and to the excitement of the waters during the fishery frightening away those dreaded creatures. The divers are sometimes paid fixed wages, others agree for one-fourth of the produce. When a boat-load of oysters has been obtained, it returns to shore, and the cargo, sometimes amounting to 20,000 or 30,000 is landed and piled on the shore to die and putrefy, in order that the pearls may be easily found. The heaps are formed in small walled compartments, the walls surrounding each being about one or two ft. in height. Several of these compart-

ments surround a small central inclosure, in which is a bath, and they slope toward this bath, and are each connected with it by a small channel, so that any pearls washed out from the putrefying mass by the rain may be carried into the bath. When the animals in the shells are sufficiently decomposed, the washing commences, and great care is taken to watch for the loose pearls, which are always by far the most valuable; the shells are then examined, and if any attached pearls are seen, they are handed over to the clippers, who, with pinchers or hammer, skillfully remove them. Such pearls are used only for setting, while the former, being usually quite round, are drilled and strung, and can be used for beads, etc. The workmen who are employed to drill the pearls also round the irregular ones, and polish them with great skill. The method of holding the pearls during these operations is very curious; they make a number of holes of small depth in a piece of dry wood, and into these they fit the pearls, so that they are only partly below the surface of the wood, which they then place in water. As it soaks up the water and swells, the pearls become tightly fixed, and are then perforated, etc. These operations are all carried on on the spot.

For many miles along the Condatchy shore, the accumulation of shells is enormous, and averages at least 4 ft. in thickness. This is not to be wondered at, when it is remembered that this fishery has been in active operation for at least 2,000 years. The place itself is exceedingly barren and dreary, and, except during the fishing season, is almost deserted; but at that time it presents an exceedingly animated spectacle; thousands of people of various countries and castes are here drawn together—some for the fishery, others to buy pearls, and others to feed the multitude. They chiefly reside in tents, so that it appears a vast encampment.

The pearls vary much in size; those as large as a pea, and of good color and form, are the best, except unusually large specimens, which rarely occur, the most extraordinary one known being the pearl owned by the late Mr. Hope, which measured 2 in. in length, and 4 in circumference, and weighed 1,800 grains. The smaller ones are sorted into sizes, the very smallest being called seed-pearls. A considerable quantity of these last are sent to China, where they are said to be calcined, and used in Chinese pharmacy. Among the Romans, the pearl was a great favorite, and enormous prices were paid for fine ones. One author gives the value of a string of pearls at 1,000,000 sesterces, or about $40,000. The single pearl which Cleopatra is said to have dissolved and swallowed was valued at $400,000; and one of the same value was cut into two pieces for ear-rings for the statue of Venus in the Pantheon at Rome. Coming down to later times, we read of a pearl in Queen Elizabeth's reign, belonging to Sir Thomas Gresham, which was valued at $75,000, and which he is said to have treated after the fashion of Cleopatra; for he powdered it and drank it in a glass of wine to the health of the queen, in order to astonish the ambassador of Spain, with whom he had laid a wager that he would give a more costly dinner than could the Spaniard.

During the occupation of Britain by the Romans that country became famous for its pearls, which were found in the fresh-water mussel of the rivers. See FRESH-WATER MUSSEL. Generally the pearls of this mollusk are small, badly colored, and often valueless; but occasionally they occur in such beauty as to rival those of the pearl-oyster. Some years ago, in the Scotch rivers, the search for pearls was prosecuted vigorously, especially by a merchant named Unger, of Edinburgh, who had brought Scotch pearls into great repute. He collected specimens ranging, as was stated, from $25 to $400 each, and formed a necklace said to be worth $1750. In Scotch pearls of the highest quality, there is a pleasing pinkish tint, which is very permanent. The fishing for pearl-mussels is by no means so dangerous and troublesome as for pearl-oysters; usually they are found in the beds of streams, shallow enough to wade in, and so clear that they can be seen at the bottom. If too deep to remove with the hand, they are easily captured by putting a stick between their gaping shells, which instantly close upon it, and can be drawn out with it. So profitable did this pursuit become that a great many persons engaged in it.

Very fine river pearls, known on the continent as Bohemian pearls, are found in the rivers of Moldau and Wottawa. There is also a fresh-water pearl fishery in Bavaria, where the river Iltz yields at times very fine specimens. Even the most inferior pearls have a market value; for pearls can only be properly polished with pearl dust, and the inferior pearls are powdered for the purpose of polishing and rounding the finer ones.

False Pearls are very admirable imitations, made by blowing very thin beads or bulbs of glass, and pouring into them a mixture of liquid ammonia, and the white matter from the scales of the bleak, and sometimes of the roach, and dace. The proper way to prepare the pearl matter is first to remove the scales of the lower part of the fish; these must then be very carefully washed, after which they are put to soak in water, when the pearly film falls off and forms a sediment at the bottom of the vessel which is removed and placed in liquid ammonia for future use. This pearl mixture, when of the best quality, is very costly, being as much as $20 or $25 per ounce. For use it is diluted with ammonia, and injected into the glass beads, so as to thinly coat them inside; afterward the better kind have melted white wax poured in, which renders them much more durable. The French and Germans produce in this way imitations of the finest oriental pearls of such beauty that the most practiced eye can hardly detect the difference. The bleak is procured in considerable quantities for this purpose from the Thames and other rivers in England. See BLEAK.

The invention of artificial pearls is due to a Frenchmen, named Jaquin, in the time of Catharine de' Medici, and the manufacture is now chiefly carried on in the department of the Seine, where great improvements have lately been made, especially in the art of giving the irregular forms of large pearls to the glass bulbs, and thus increasing the resemblance, and in removing the glassy appearance caused by the exterior glass coating, by exposing it for a short period to the action of the vapor of hydrofluoric acid. Mucilage of fine gum arabic is also used instead of wax, which increases the translucency, gives greater weight, and is not liable to melt with the heat of the wearer's body—a defect to which those filled with wax are very liable.

Roman pearls differ from other artificial pearls, by having the coating of pearly matter on the outside, to which it is attached by an adhesive substance.

PEARL, a river of Mississippi, which rises about 100 m. n.n.e. of Jackson, and, flowing s. through the state, separates it in its lower course from Louisiana, and empties into Mississippi sound, near the outlet of lake Pontchartrain. It flows nearly 300 m. through a fertile cotton country, and is navigable to Jackson, the capital.

PEARL ASHES. See POTASH.

PEARL BARLEY. See BARLEY.

PEARL OYSTER, *Avicula* or *Meleagrina margaritifera*, a lamellibranchiate mollusk, of the family *Aviculidæ*, generally found—great numbers together—attached to submarine rocks at a considerable depth on the coasts of tropical countries, and important as producing almost all the pearls and all the mother-of-pearl of commerce. It is sometimes called the PEARL MUSSEL; but the family to which it belongs differs considerably both from that of mussels and from that of oysters, the valves of the shell being unequal, the hinge-line straight and long, and the animal furnished with two adductor muscles, one of them small, and with a foot by which it produces a byssus. The pearl oyster is of an oblique oval form, longitudinally ribbed, and with concentric foliations when young which disappear when it is old. It attains a large size, and there are several varieties, the most important of which are noticed in the article MOTHER-OF-PEARL. The whole inside of the shell is covered with a thick layer of nacre or mother-of-pearl, compact and beautiful, forming indeed the chief part of the shell, and exhibiting very considerable variety of color, most frequently white, but sometimes blood-red. Pearls are formed of the same substance (see PEARL) and are generally, if not always, produced by eggs which have become abortive, and which remain lodged within the mullusk instead of being ejected into the sea.

The pearl oyster is too rank and coarse to be eaten. When taken from the sea it is commonly laid out in the sun to die, that the pearls may be sought for after the shell opens.

The pearl oyster is not the only mullusk which produces pearls. The *Placuna placenta*—an oyster (family *Ostreadæ*) with thin transparent shell, which is used in China and elsewhere as a substitute for window glass—produces diminutive pearls. The fresh water mussel (q.v.) of Britain produces pearls sometimes of considerable beauty and value; and instances have occurred of pearls being found in pinnæ, etc., and even in limpets. See illus., MOLLUSKS, vol. X.

PEARL SHELLS. See MOTHER-OF-PEARL.

PEARL WEDDING. See WEDDING ANNIVERSARIES.

PEARL WHITE. See WHITE COLORS.

PEARSON, JOHN, an English prelate of high celebrity, was b. in 1612 at Snoring, in Norfolk, of which place his father was rector; educated at Eton and King's college, Cambridge, where he took the degree of M.A. in 1639, and in the same year took orders, and was collated to a prebend in Salisbury cathedral. In 1640 he was appointed chaplain to Finch, lord-keeper of the great seal, and on the outbreak of the civil war became chaplain to lord Goring, and afterward to sir Robert Cook, in London. In 1650 he was appointed minister of St. Clement's, Eastcheap, London; and in 1659 published the great work by which he is now remembered, *An Exposition of the Creed.* It was dedicated to his flock, to whom the substance of it had been preached some years before in a series of discourses. The laborious learning and the judicial calmness displayed by the author in this treatise have long been acknowledged, and command the respect even of those who think his elaborate argumentation tedious and not always forcible. It is generally reckoned one of the ablest works produced in the greatest age of English theology—the 17th century. During the same year, Pearson published *The Golden Remains of the Ever Memorable Mr. John Hales of Eton.* At the restoration, honors and emoluments were lavishly showered upon him. Before the close of 1660 he received the rectory of St. Christopher's, in London; was created D.D. at Cambridge; installed prebendary of Ely and archdeacon of Surrey; and made master of Jesus college, Cambridge. In 1661 he obtained the Margaret professorship of divinity, and was one of the most prominent commissioners in the famous Savoy conference; in 1662 he was made master of Trinity, Cambridge, and in 1672 was promoted to the bishopric of Chester. The year before he had published his *Vindiciæ Epistolarum S. Ignatii*, in answer to M. Daillè, who had denied the genuineness of the epistles. It was imagined for years that Pearson had triumphed over his opponent. The history of the controversy, however (see IGNATIUS),

has shown that Daillè was right and Pearson wrong. In 1684 appeared his *Annales Cyprianici*. He died, July 16, 1686. Pearson's *Opera Posthuma Chronologica* were published by Dodwell (Lond. 1688), and his *Orationes, Conciones et Determinationes Theologicæ* contain much valuable matter, for, as Bentley used to say, Pearson's "very dross was gold." Bishop Burnet thought him "in all respects the greatest divine of his age."

PEASANT WAR, in German history, the name given to that great insurrection of the peasantry which broke out in the year 1525, and which Zschokke has described as the "terrible scream of oppressed humanity." The oppression of the peasants had gradually increased in severity, as the nobility became more extravagant and the clergy more sensual and degenerate. The example of Switzerland encouraged the hope of success, and from 1476 to 1517 there were risings here and there among the peasants of the s. of Germany. A peasant rebellion, called from its cognizance the *Bundschuh* (laced shoe), took place in the Rhine countries in 1502, and another, called the "League of Poor Conrad," in Würtemberg, in 1514, both of which were put down without any abatement of the grievances which occasioned them. The reformation, by the mental awakening which it produced, and the diffusion of sentiments favorable to freedom, must be reckoned among the causes of the great insurrection itself; although Luther, Melanchthon, and the other leading reformers, while urging the nobles to justice and humanity, strongly reprobated the violent proceedings of the peasants. The Anabaptists, however, and in particular Münzer, encouraged and excited them, and a peasant insurrection took place in the Hegau in 1522. Another, known as the "Latin war," arose in 1523 in Salzburg, against an unpopular archbishop, but these were quickly suppressed. On Jan. 1, 1525, the peasantry of the abbacy of Kempten, along with the townspeople, suddenly assailed and plundered the convent, compelling the abbot to sign a renunciation of his rights. This proved the signal for a rising of the peasants on all sides throughout the s. of Germany. Many of the princes and nobles at first regarded the insurrection with some measure of complacency, because it was directed in the first instance chiefly against the ecclesiastical lords; some, too, because it seemed likely to promote the interests of the exiled duke of Würtemberg, who was then upon the point of reconquering his dominions by the help of Swiss troops; and others, because it seemed to set bounds to the increase of Austrian power. But the archduke Ferdinand hastened to raise an army, the troops of the empire being for the most part engaged in the emperor's wars in Italy, and intrusted the command of it to the Truchsess Von Waldburg, a man of stern and unscrupulous character, but of ability and energy. Von Waldburg negotiated with the peasants in order to gain time, and defeated and destroyed some large bodies of them, but was himself defeated by them on April 22, when he made a treaty with them, not having, however, the slightest intention of keeping it. Meanwhile the insurrection extended, and became general throughout Germany, and a number of towns took part in it, as Heilbronn, Mühlhausen, Fulda, Frankfort, etc., but there was a total want of organization and co-operation. Toward Easter, 1525, there appeared in upper Swabia a manifesto, which set forth the grievances and demands of the insurgents. They demanded the free election of their parish clergy; the appropriation of the tithes of grain, after competent maintenance of the parish clergy, to the support of the poor and to purposes of general utility; the abolition of serfdom, and of the exclusive hunting and fishing rights of the nobles; the restoration to the community of forests, fields, and meadows, which the secular and ecclesiastical lords had appropriated to themselves; release from arbitrary augmentation and multiplication of services, duties, and rents; the equal administration of justice; and the abolition of some of the most odious exactions of the clergy. The conduct of the insurgents was not, however, in accordance with the moderation of their demands. Their many separate bands destroyed convents and castles, murdered, pillaged, and were guilty of the greatest excesses, which must indeed be regarded as partly in revenge for the cruelty practiced against them by Von Waldburg. A number of princes and knights concluded treaties with the peasants conceding their principal demands. The city of Würtzburg joined them, but the castle of Leibfrauenberg made an obstinate resistance, which gave time to Von Waldburg and their other enemies to collect and strengthen their forces. In May and June, 1525, the peasants sustained a number of severe defeats, in which large bodies of them were destroyed. The landgraf Philip of Hesse was also successful against them in the n. of Germany. The peasants, after they had been subjugated, were everywhere treated with terrible cruelty. In one instance a great body of them were perfidiously massacred after they had laid down their arms. Multitudes were hanged in the streets, and many were put to death with the greatest tortures. Weinsberg, Rothenburg, Würtzburg, and other towns which had joined them, suffered the terrible revenge of the victors, and torrents of blood were shed. It is supposed that more than 150,000 persons lost their lives in the Peasant war. Flourishing and populous districts were desolated. The lot of the defeated insurgents became harder than ever, and many burdens of the peasantry originated at this period. The cause of the reformation also was very injuriously affected. See Sartorius, *Versuch einer Geschichte des Deutschen Bauernkriegs* (Berl. 1795); Ochsle, *Beiträge zur Geschichte des Deutschen Bauernkreigs* (Heilbronn, 1829); Wachsmuth, *Der Deutsche Bauernkreig* (Leip. 1834); and Zimmermann, *Allgemeine Geschichte des grossen Bauernkreigs* (3 vols. Stuttg. 1841–43).

PEASE, Calvin, d.d., 1813–63; b. Conn.; graduated at the university of Vermont in 1838; became a teacher in Montpelier; was professor of Greek and Latin in the university of Vermont in 1842–55, and its president in 1855–61. In 1855 he was ordained; in 1856 was chosen president of the Vermont board of education. In 1862 he became pastor of the First Presbyterian church, Rochester, N. Y.

PEASLEE, Edmund Randolph, ll.d., 1814–78; b. N. H.; graduated from Dartmouth college 1836, and was tutor there for two years. He studied at the Yale medical school, and in 1841 began practice at Hanover, N. H. He was appointed professor of anatomy and physiology at Dartmouth college in 1842, and retained the position for nearly 40 years. He was a lecturer and professor in Bowdoin college also. In 1851 he was made professor of physiology and pathology in the N. Y. medical college, and in 1858 of obstetrics. In the latter year he began to reside in N. Y. city, where he had already obtained a large practice and a high rank, especially in obstetrics and gynecology. He was a member and officer of many medical societies of both continents, published many contributions to medical and scientific periodicals, and two books—*Human Histology* (1857) and *Ovarian Tumors and Ovariotomy* (1872).

PEA-STONE, Pi'solite, or Pi'siform Limestone, is a kind of calcareous spar or limestone, which occurs in globules from one-eighth of an inch to half an inch in diameter, imbedded in a cement of similar substance. There is generally a grain of sand in the center of each globule as the nucleus, around which it has been formed, and the concentric plates of its structure are easily visible. Sometimes the nucleus is merely a bubble of air. Pea-stone is found in great masses near the hot springs of Carlsbad, in Bohemia. See illus., Geology, vol. VI.

PEAT, a substance formed by the decomposition of plants amidst much moisture, as in marshes and morasses; and sometimes described as a kind of *humus* (q.v.), formed by the accumulation of the remains of mosses and other marsh-plants. The remains of the plants are often so well preserved in it that the species can be easily distinguished. Reeds, rushes, and other aquatic plants may usually be traced in peat, and stems of heath are often abundant in it; but it chiefly consists, in the northern parts of the world, of different species of *sphagnum* (q.v.), or bog-moss. Mosses of this genus grow in very wet situations, and throw out new shoots in their upper parts, whilst their lower parts are decaying and being converted into peat; so that shallow pools are gradually changed into bogs. It was at one time believed that bogs owed their origin to the destruction of forests, the fallen trees impeding the natural drainage, and causing the growth of those marsh-plants of which peat is formed; and this theory was supported by reference to instances supposed to be authenticated by tradition—as that of the moor of Hatfield in Yorkshire, now consisting of about 12,000 acres of peat, and said to have been a forest of firs, till "the Romans under Ostorius, having slain many Britons, drove the rest into the forest," which was then destroyed by the victors. There are, however, satisfactory proofs that peat has accumulated in many places around trees; and firs remaining in their natural position have been found to have 6 or 7 ft. of peat under their roots, although other trees, as oaks, are commonly found with their stumps resting on the soil beneath the peat. Yet it is not improbable that the destruction of forests may, in some instances, by impeding the course of the streams which flowed through them, have caused the stagnation of water from which the growth of peat resulted. Some of the largest mosses and fens of Europe occupy the place of forests, which were destroyed by order of Severus and other Roman emperors; and some of the British forests, now mosses, as well as some of those of Ireland, were cut because they harbored wolves or outlaws. The overthrow of a forest by a storm in the 17th c. is known to have caused the formation of a *peat-moss* near loch Broom, in Ross-shire. Layers of trees are not unfrequently found in peat, which seem to have been suddenly deposited in their horizontal position, and sometimes to have been felled by human hands. It is not improbable, however, that sometimes peat has been formed where the soil has been exhausted by the long-continued growth of one kind of tree. The growth of peat is often rapid: bogs have been known to increase 2 in. in depth in a year. The surface of a bog sometimes becomes a floating mass of long interlaced fibers of plants, known in Ireland as *Old Wives' Tow.* The vegetation on the surface is sometimes very green and compact, like a beautiful turf.

Peat is vegetable matter more or less decomposed, and passes by insensible degrees into lignite (q.v.). The less-perfectly decomposed peat is generally of a brown color; that which is more perfectly decomposed is often nearly black. Moist peat possesses a decided and powerful antiseptic property, which is attributed to the presence of gallic acid and tannin, and is manifested not only in the perfect preservation of ancient trees and of leaves, fruits, etc., but sometimes even of animal bodies. Thus, in some instances, human bodies have been found perfectly preserved in peat, after the lapse of centuries.

The formation of peat may be regarded as one of the most important geological changes now in evident progress. It takes place, however, only in the colder parts of the world. In warm regions, the decay of vegetable substances, after life has ceased, is too rapid to permit the formation of peat. The surface covered by peat is very extensive in all the colder parts of the world; although in the southern hemisphere no moss seems to enter into its composition; and the South American peat is said by Mr. Darwin to be formed of many plants, but chiefly of *astelia pumila,* a phanerogamous plant of the rush

family. The surface covered by peat even in England is considerable; it is greater in Scotland, and very great in Ireland. Extensive tracts are covered with peat even in the southern countries of Europe, and sometimes even near the sea; and in more northern regions, the *mosses* or *bogs* are still more extensive. For their physical characters, and the mode of *reclaiming* them, or converting them into arable land, see Bog.

Mere peat is not a good soil, even when sufficiently drained, but, by the application of lime, marl, etc., it is soon converted into good soil, yielding excellent crops. A mixture of peat is often of benefit to soils otherwise poor. And for many shrubs, as rhododendrons, kalmias, whortleberries, etc., no soil is so suitable as one in great part composed of peat; which is therefore in much request with gardeners in order to the formation of the soil for certain kinds of plants.

Peat is extensively used for fuel. The more perfectly decomposed that the vegetable matter is, and the more consolidated that the peat therefore is, the better it is suited for this use. It is the ordinary fuel of great part of Ireland, and is there almost always called *turf*, although the term turf, in its ordinary English sense, is utterly inapplicable to it. To procure peat for fuel, the portion of bog to be operated upon must first be partially dried by a wide open drain; its surface is then pared off with the spade, to the depth of about 6 in., to remove the coarse undecomposed vegetable matter; the peat is afterwards cut out in pieces (*peats*) like bricks, by means chiefly of a peculiar implement, called in Ireland a *slane*, and in Scotland a *peat-spade*, resembling a long, narrow, sharp spade, the blade of which is furnished on one side with a tongue set at a right angle to it. This implement is used by the hands alone, without pressure of the foot. The soft peats are conveyed to some neighboring place, where they are set up on end in little clusters to dry. When sufficiently dry, they are conveyed away, and may be piled in out-houses or stacked in the open air. The operation of *peat-cutting* is always performed in spring or summer.—Where peat for fuel cannot be obtained in the way just described, the black mud of a semi-fluid bog is sometimes worked by the feet of a party of men, women, and children until it acquires such a consistency that it can be molded by the hand. The process is laborious, but the fuel obtained by it is good.—In countries depending on peat for fuel, a very rainy season sometimes occasions great inconvenience, and even distress, by preventing the cutting and drying of the peat.

Peat is a light and bulky kind of fuel, and cannot be conveyed to considerable distances without too great expense. Efforts have, however, been made, both in Scotland and Ireland, to render it more generally useful, and so to promote the reclaiming of bogs by so compressing it until its specific gravity is nearly equal to that of coal. For this purpose it is first reduced to a pulp. The compressing of peat has not yet been advantageously prosecuted on an extensive scale.

Peat-charcoal, made from uncompressed peat, is very light and inflammable, and therefore unsuitable for many purposes, but for others it is particularly adapted, and no kind of charcoal excels it in antiseptic and deodorizing properties. It is also an excellent manure for many kinds of soil, and great crops have often been obtained by its use. Peat-charcoal is highly esteemed for the smelting of iron, and for working and tempering the finer kinds of cutlery. Charcoal made from compressed peat is in density superior to wood-charcoal, and is capable of being used as coke. The Irish amelioration society, some years ago, encouraged the conversion of peat into charcoal, but it seems not to have paid as a commercial speculation, although the resulting charcoal was of good quality. Various companies have been formed for the purpose of obtaining valuable products from the destructive distillation of peat. It appears from researches of sir R. Kane and others that 1000 parts of peat yield about 11 of sulphate of ammonia, 7 of acetate of lime, 2 of wood naphtha, 1 of paraffin, 7 of fixed oil, and 3 of volatile oil. The manufacture has not, however, as yet proved sufficiently profitable to be generally adopted, although the distillation of peat has, we believe, been carried on for some years at Athy, near Kildare. For further details on this subject, the reader is referred to a parliamentary *Report on the Nature and Products of the Destructive Distillation of Peat*, published in 1851, and to a paper by Dr. Paul in the 6th volume of *The Chemical News*. A more recent contribution to the subject is *The Peat Mosses of Buchan*—by the rev. James Peter, minister of Deer (Aberdeen, 1875).

Flower-pots are sometimes made of peat. It is easy to transplant flowers growing in them without loosening the earth from the roots, the pot being readily cut to pieces; and liquid manure applied outside finds its way sufficiently to the roots.

PEA WEEVIL, *Sitona crinita* and *S. lineata*, small coleopterous insects, about a quarter of an inch long, which are very destructive to crops of peas and other kinds of of pulse, devouring the leaves and other succulent parts, often soon after the plants appear above ground. Lime, soot, or wood ashes dusted over the plants protect them in some measure from the ravages of these insects; and hoeing or other stirring of the soil is beneficial, probably by destroying the eggs, larvæ, and pupæ.

PEBBLE (probably allied to *bubble*, from the sound of water running among stones), a small, round, water-worn stone of any kind; but with jewelers sometimes an agate—agates being often found as loose pebbles in streams, and those of Scotland in particular being popularly designated *Scotch pebbles*. Hence the name has come even to be extended to rock-crystal, when not in the crystalline form, and we hear of spectacles

with eyes of pebble, etc. Deposits of pebbles (in the sense of water-worn stones occur among the rocks of all periods, but the pebbles are seldom loose; they are generally cemented together by iron, lime, or silex, forming a pudding-stone of greater or less hardness. Single pebbles are sometimes found in deposits which have been formed at a distance from currents in perfectly still water, as in chalk and fine silt. They must have been floated to their places entangled in the roots of trees, or attached to the roots of large buoyant sea-weeds.—Brazilian Pebbles (so called from Brazil having been long famous for the purity of its rock crystal), are very pure pieces of rock crystal (q.v.), used by opticians for making the lenses of spectacles, etc.

PECAN'. See Hickory.

PECCARY, *Drycoteles,* a genus of *pachydermata,* of the family *suidæ,* much resembling hogs; but having a mere tubercle instead of a tail; only three toes—no external toe—on the hind-feet; the molar teeth and incisors very like those of hogs, but the canine teeth not nearly so long and not curving outwards. An approach to ruminants is seen in the stomach, which is divided into several sacs; also in the union of the metacarpal and metatarsal bones of the two greater toes into a kind of cannon bone. A glandular opening on the loins, near the tail, secretes a fetid humor. Only two species are known, both natives of South America; and, except the tapirs, the only existing pachydermata of the American continent.—The Common Peccary, Collared Peccary, or Tajaçu (*D. torquatus*), is found in almost all parts of South America; the White-lipped Peccary (*D. labiatus*) is found in many parts of it. Both are gregarious; the white-lipped peccary often assembling in very large herds, and sometimes doing great mischief to maize and other crops. The herds of the white-lipped peccary seem to follow a leader, like those of ruminants. The common peccary chiefly frequents forests, and small companies sometimes take up the abode in the hollow of a great tree. The common peccary is about the size of a small hog, grayish; the hairs alternately ringed with black and yellowish white, bristly; and on the neck longer, and forming a mane. A narrow white collar surrounds the neck. The white-lipped peccary is considerably larger, of a darker color, with conspicuously white lips. The ears are almost concealed by the hair. Both species are capable of being tamed, but are of irritable and uncertain temper. In a wild state they defend themselves vigorously against assailants, making good use of their sharp tusks, and a whole herd combine for defense. The hunter has often to take refuge from them in a tree. They are omnivorous; and if hurtful to crops, render service by destroying reptiles. Their voice is somewhat like that of the hog, but more sharp. Their flesh resembles that of the hog, but is said to be inferior. The glands on the loins must be cut out immediately after the peccary is killed, or their fetid humor infects the whole flesh. See illus., Mammalia, vol. IX.

PE-CHIH-LE. See Chih-le.

PECK, a measure of capacity for dry goods, such as grain, fruit, etc., used in America, and equivalent to 2 imperial gallons, or 554.54 + cubic inches. It is thus the fourth part of a bushel (q.v.).

PECK, George, D.D., 1797–1876; b. N.Y.; joined the Genesee conference of the Methodist Episcopal church in 1816; appointed presiding elder of the Susquehanna district in 1824; was principal of the Oneida conference seminary in 1835–40, and in the last year was elected editor of the *Methodist Quarterly Review,* which position he filled for eight years. In 1848 he was elected chief editor of the *Christian Advocate and Journal,* in New York, retaining the position for four years. He was pastor at Wilkesbarre, Scranton, Providence, Dunmore; and his public labors included a period of 60 years. His published works are *Universalism Examined; Scripture Doctrine of Christian Perfection; Rule of Faith; Reply to Bascom; Manly Character,* and *Our Country.*

PECK, Harry Thurston, PH.D., L.H.D., was born in Stamford, Conn., in 1856. He was educated at Columbia College, from which institution he graduated with honors in 1881, receiving at once an appointment to a classical fellowship. After a year spent in advanced study, he was made instructor in the department of Latin, and a little later, lecturer on Biblical Hebrew. In 1886, on the death of Prof. Charles Short, Dr. Peck was placed in charge of the Latin chair, and in 1888, after spending some time in study abroad at the University of Berlin, he was elected to the full professorship of the Latin language and literature, a position which he still holds. On the reorganization of Columbia as a university, in 1890, Prof. Peck was a member of the first University Council. He has also held the appointment of lecturer in classical philology in the Barnard College for Women. He is a member of the American Philological Society, of the American Oriental Society, of the American Folk-Lore Society, of the Archæological Institute of America, and of the New York Academy of Anthropology; and one of the incorporators of the Columbia University Press, of which he is now a Trustee. Among his published works are *The Semitic Theory of Creation* (1885), *Suetonius* (2d ed. 1893), *Latin Pronunciation* (2d ed. 1894), *A History of the Latin Language* (1894), and numerous papers, reviews, addresses, etc., besides fugitive verses, some of which will be found in Stedman's *Library of American Literature,* vol. XI. In conjunction with Prof. E. M. Pease, of Bowdoin College, Prof. Peck has brought out a series of Latin classics for college use, and since 1890 he has been Editor-in-chief of the *International Cyclopædia,* besides editing *Appleton's Atlas of Modern Geography* (1892), *Harper's Dictionary of Classical Literature and Antiquities* (1894), the *University Bulletin,* and *Classical Studies* (1895). In 1895 he published *Roman Life in Latin Prose and Verse,* and became editor of *The Bookman.*

PECK, JESSE TRUESDELL. D.D., b. N. Y., 1811; joined the Oneida conference in 1832; was principal of the Gouverneur Wesleyan seminary in 1837–41, and of the Troy conference academy at West Poultney, Vt., in 1841–48; president of Dickinson college in 1848–52; pastor of the Foundry church in Washington, D. C., two years. In 1854 he was appointed secretary and editor of the Methodist tract society; labored eight years in California as pastor and presiding elder. Returning to the east he was pastor in Peekskill, Albany, and Syracuse, and in 1872 was lected bishop. He was one of the founders of the Syracuse university. Dr. P. published *The Central Idea of Christianity; The True Woman; The History of the Great Republic Considered from a Christian Standpoint.* He d. 1883.

PECK, JOHN JAMES, 1821–78; b. N. Y.; educated at West Point, and in 1843 received the commission of lieut. in the artillery. He served at Palo Alto, Monterey, and several other battles of the Mexican war; at the assault on Molino del Rey displayed great gallantry, and was brevetted major. In 1853 he resigned his commission and became a banker in Syracuse, N. Y. He took great interest in politics, and was a delegate to the democratic national conventions of 1856 and 1860. In 1861 he was made brig.gen. of volunteers, and placed in command of a brigade of the 4th corps. He was present at the battles of Williamsburg and Fair Oaks, at the siege of Richmond, and had charge of the defense of Suffolk, Va. In 1864 he was employed in North Carolina, and the same year was given command of the forces near the Canadian border. He was mustered out in 1865, and until his death was engaged in the insurance business in New York, being for many years president of the New York state life insurance co. of Syracuse.

PECK, JOHN MASON, D.D., 1789–1858; b. Conn.; removed in 1811 to Greene co., N. Y., where he united with a Baptist church; and in 1814 became pastor of a church in Amenia, N. Y. In 1817 he was an itinerant missionary in Illinois and Missouri. He was the principal in 1830–31 of a seminary at Rock Spring, Ill. He was one of the founders of the theological seminary at Covington, Ky.; in 1843–45 he was secretary of the American Baptist publication society. From 1829 he edited for several years a periodical, *The Pioneer.* He published *The Emigrant's Guide; A Gazetteer of Illinois; Life of Daniel Boone*, in Sparks's *American Biography; Life of Father Clark*, a western preacher.

PECK, WILLIAM GUY, LL.D., b. Conn., 1820; educated at West Point, and in 1844 received a commission as lieut. in the corps of topographical engineers. From 1847 to 1855 he was assistant professor of mathematics at the military academy. In 1855 he resigned, and was made professor of physics and engineering at the university of Michigan. In 1857 he accepted the position of professor of mathematics and astronomy in Columbia college, New York, which he held till 1892. Dr. P. published *Elements of Mechanics*, 1859; an edition of Ganot's *Natural Philosophy*, 1860; and was joint editor with Davies of the *Mathematical Dictionary and Cyclopædia of Mathematical Science.* He published several text-books also. Died, 1892.

PECORA (Lat. cattle), a Linnæan order of mammalia, now generally called ruminantia (q.v.).

PECOS, a river of Texas, rises in the mountains near Santa Fé, New Mexico, runs south-easterly 600 m. through New Mexico and Texas, and flows into the Rio Grande-del-Norte, in lat. about 29° 20′ n., long. 102° west.

PECOS, a co. in w. Texas, bounded on the e. and n. e. by the Pecos river, and on the s. by the Rio Grande; about 6700 sq.m.; pop. '90, 1326, chiefly of American birth. It is well adapted to grazing, and has some good farming land. Co. seat, Fort Stockton.

PECQUET JEAN, 1620–74; b. Dieppe. He studied medicine at Montpellier, where he soon made the important discovery of the course of the lacteal vessels, including the situation of the sac, called the *receptaculum chyli*, or reservoir of Pecquet, as it is sometimes called, and the termination of the principal lacteal vessel, the thoracic duct, into the left subclavian vein. Pecquet was one of the first members of the Academy of Sciences at Paris. His principal works are: *Experimenta Nova Anatomica* (Paris, 1651); and *De Circulatione Sanguinis et Chyli Motu*, and *De Thoracicis Lacteis* (1654).

PECTEN, a genus of lamellibranchiate mollusks, commonly referred to the same family with the oyster (*ostreadæ*), which is sometimes called *pectinidæ.* The shell has neither teeth nor laminæ in the hinge; the valves are unequal, one of them being often much more convex than the other; the shape is regular; the hinge is extended by *ears*, and in most of the species both valves have ribs radiating from the umbo to the margin. Hence the name *pecten* (Lat. a comb), from the appearance which they present. The animal has a small foot; some of the species are capable of attaching themselves by a byssus; they are capable also of locomotion by opening and rapidly closing the valves, and in this way can even regain the sea from a short distance by leaping on the shore. Some of the larger species are often popularly called *clams*, a name shared by other bivalves. *P. Jacobæus*, a native of the Mediterranean, is the SCALLOP-SHELL which pilgrims were accustomed to wear in front of their hats, in token of their having visited the shrine of St. James at Compostella.

PECTIC ACID AND **PECTINE.** See FRUITS.

PECTINIBRANCHIA'TA (Lat. comb-gilled), an order of gasteropodous mollusks, having the gills composed of numerous leaflets or fringes, arranged like the teeth of a comb,

and affixed to the internal surface of a cavity which opens with a wide opening above the head. The sexes are distinct. To this order belong whelks and periwinkles.

PECTORIL'OQUY is a term of such frequent occurrence in the history of chest diseases as to require a brief notice in this work. If the stethoscope be applied to the chest of a healthy person, and he be requested to speak, the sounds of his voice will be conveyed to the ear of the observer with very different degrees of clearness, according to the part of the chest on which the base of the instrument rests. If, for example, it be applied at the top of the sternum or breast-bone the voice will reach the ear, through the tube, with tolerable distinctness. For a short distance on either side of the sternum, just below the collar-bones, and in the arm-pits, the voice is still heard, but the sound is indistinct and confused. Below the third rib, and over the remainder of the chest, the voice only produces an obscure thrilling sound, which is known as *pectoral resonance*. In certain morbid conditions the sounds of the voice seem to proceed with distinctness from the walls of the chest directly into the ear; and then, in place of the normal pectoral resonance, we have the physical sign known as pectoriloquy (from the Latin *pectore*, from the chest, and *loquor*, I speak). It occurs when a tolerably superficial excavation, of moderate or considerable size, lies under the stethoscope.

PECTOSE. See FRUIT.

PEDAGOGY or **PÆDAGOGY** (Gr. *παιδαγωγία*; *παιδαγωγός*, *παῖς*, boy, and *ἄγειν*, to lead, among the Greeks was the slave who accompanied the child of his master to the palæstra, watched over him at his games, and instructed him in personal conduct), the science of education. Pædagogy is a derived science, based principally upon psychology. The aim of the latter science is to determine the nature of complete personality in the various stages of its growth, and the laws and conditions of its development. As education is a process directed toward the most perfect development of full personality, it follows that the science of education must, of necessity, fundamentally embody psychological principles and treat of their consistent application. As a science pædagogy scarcely goes back of Herbart (1776–1841). Pestalozzi (1746–1827) inculcates the truth of the principle that all education must be based upon the laws of the development of the human soul; its methods, consequently, cannot be arbitrary, but must be founded upon the laws of nature. "The natural harmonious development of all the powers of a human being for the sake of his true moral nature" is to him the desired end. Herbart was the real founder of modern scientific pædagogy, in that he was the first to insist that a rational system of education must be fundamentally based upon a true psychology. It is the aim of the science of pædagogy to unfold, in the first place, the general idea of education by means of the scientific investigation of its nature. It must exhibit, furthermore, the particular phases under all conditions of the general subject; it must consider in all its complexities the nature of the being who is to be taught; it must determine the nature and extent of the means by which the desired growth shall be promoted, and it must decide upon the proper methods by which the matter taught shall be most profitably presented. It should include, finally, in its perfect elaboration, a consideration of the historical development of education and account for the particular systems that have arisen among the various nations of the world, in order to put us of the present into possession of the educational experience of the past.

On account of its dependence upon psychology, the detailed principles of pædagogy have been formulated in different ways, according to the psychological views held by the writer. Two of these theories have acquired especial importance. One school of writers holds to the *a priori*, or rational, method of psychology, and deduces from the original constitution of mind the principles of educational development. Man, from this standpoint, is a being in the process of development; his true nature is not already realized at birth, but has to be developed and made actual by education, which in this way helps to make real what was already possible. In the undeveloped mind nearly all is potential, and but little has been actualized. Rosencranz (1805–79), whose psychological basis is the system of Hegel, is an admirable exponent of this method. Education to him consists in the development in man of his inborn rationality. Its form is determined by the nature of mind. This system particularly emphasizes the idea of "self-estrangement" as the fundamental principle of education. Man must by education estrange himself from his animal nature and assimilate himself to his ideal nature. All culture must of necessity pass through the two stages of estrangement and its removal. Culture first develops the contrast between the strange and the familiar, in order, however, to annul it and make it well known. The aim of education is to arouse in the pupil a spiritual and ethical sensitiveness, which forbids him to look upon anything as merely indifferent. Religious education is made by this theory the last and highest form of the particular elements of education.

Another school of writers takes less into consideration the original conditions and constitution of mind, but adopts the *a posteriori* phase of mental action as a standpoint from which to observe the problems of education. These writers consider primarily the growth of mind and its continually changing content, and ignore to a great extent, or take for granted, its original conditions. This, concisely put, is the standpoint of Herbart, although, since his day, his followers in Germany have gone apart in their specific interpretation of his doctrines. Two schools in this way have arisen: one,

headed by Stoy, holding to Herbart's theory more in its original form; the other, headed by Ziller, giving it a wider and freer construction. The controlling element in the Herbartian view of the matter is the mental process of "apperception," or the assimilation of ideas. Stated in general terms, apperception, according to this formulation, is the process of giving significance to facts by relating them to knowledge already established; in other words, it is "the assimilation of ideas by means of ideas already possessed." In an ordinary act of apperception the mind holds in attention not only the new notion, but also the other idea to which it must be related in order to acquire significance. All systematic education is to be arranged on this basis. The laws of development of the mind of the child must determine the methods of instruction, which in every stage should be made to fit the particular stage of the development of mind. This theory, accordingly, demands the most perfect possible adjustment of the subject-matter of education to the mind to be educated. What the mind already holds within it becomes the continual subject of inquiry and forms the basis of all instruction, since the past experience of the individual must furnish the key to educational progress. All instruction, furthermore, by this theory shall tend directly toward the formation of moral character.

Still another standpoint from which to investigate the problems of education is that of physiological psychology. That physiology plays an important part in education is apparent. In the growth of mind the physical side is a constant element, since it is only through the senses that a knowledge of the outer world is gained. In this phase of the subject the effect of external stimulus to produce sensations of sight, hearing, touch, smell, and taste is not only investigated and the capacity of the mind for memory, association, and the like determined, but the essential conditions of bodily health are inquired into and the best means of securing the ends of educational development, in accordance with its principles, are deduced. The whole matter of school hygiene in its particular application—size and shape of rooms, lighting, warming, ventilation, furniture, and appliances—belongs here.

Chiefly from these three points of view, as described here in their essential elements, a science of education has been evolved. Both the system based upon the rational phase of psychology and that founded upon the psychology of experience must include, to no small extent, the facts of physiological psychology. The prominence given to "apperception," a particular formulation of the familiar concept of the "association of ideas," is the great distinguishing characteristic of the school which adopts the concrete phase of mental life as its standpoint.

Among the many particular problems of pædagogy three stand out with especial prominence. They are, first, with regard to the selection of the subject-matter of education, where the question to be answered is, *What* shall be taught? second, with regard to the arrangement and relationship of the subject-matter, where the question is, *When* shall it be taught? And, third, as to the method of instruction, when the question becomes, *How* shall the subject be taught?

1. Subject-matter. The ideal of education has varied within the widest limits, according to the degree of civilization and the environment of the people who have held it. By its very essence, education must, at all times, have inevitably corresponded with some recognized human need, or, at least, have proceeded in the direction of what it was felt, at a particular time and under particular circumstances, man in his full development should be. The Greeks, who may be said to have first taught education as a science, for instance, developed pre-eminently what is called the culture or humane type; the Romans the industrial or professional type. In more recent times we have had the views of the humanists, the realists, and the naturalists. Modern pædagogy presupposes a choice in the subject-matter of instruction based upon psychological needs; in other words, its aim in this direction is to determine upon a psychological basis what studies, in accord with the culture of the day, shall be taken up and in what order of succession the different parts of a study shall follow. As the choice of the subject-matter of instruction varies among different people, at different times, and under different conditions, it follows that there is no unanimity of opinion as to what this subject-matter shall be. In the American common schools, the reading, writing, and arithmetic, originally taught when schools were intended to impart only the rudiments of knowledge, have been succeeded by a traditional curriculum which includes, besides, as fundamental subjects, grammar, geography, and history. Certain German writers suggest as the subjects of elementary instruction the following nine: Object teaching, reading, writing, religion, the native language, history, geography, natural history, and mathematics. There are two principal theories as to the order in which the parts of a subject shall be presented: one the *historical* method, and the other the *concentric* method, so called. The *historical* method assumes that the child in the process of development successively passes through all the stages of culture through which the human race has passed in its historical development. The subjects of instruction, accordingly, are to be presented to the mind of the child in such a way that he may repeat, as near as may be, ideally the process that has happened really. According to Ziller, the original exponent of this method, the subject-matter is "only to be borrowed from that culture development which is parallel to the pupil's present condition of mind." All school studies are classified primarily into two groups, culture studies and nature studies. The first group comprises: history, sacred and profane; literature; art, as drawing and music; languages, native and foreign.

The second group includes: geography; natural history, physics, and chemistry; arithmetic; geometry; practical exercises; gymnastics. This theory, further, as elaborated by Ziller and Rein, insists upon the idea of *concentration*. In the culture studies, about the subjects of religion and history as a centre, all other subjects of instruction are to be arranged and so related that none shall stand by itself apart from the others. Ziller and his followers recommend, in this way, for the first year of instruction in the culture studies Grimm's *Fairy Tales*, for the second year *Robinson Crusoe*. The nature studies in the first year, for instance, are to take account of all the subjects in their particular field suggested by Grimm's *Fairy Tales*. The *concentric* method presupposes that at first a few central facts of a subject shall be selected, and then that these shall be systematically widened, like a growing series of circles, by the addition of new facts, until the entire subject is covered.

2. Co-ordination. This phase of the subject is intimately connected with the preceding, which it in reality supplements, since, in order to bring the subjects of instruction also into the desired relationship with each other, some certain order of succession must be determined upon and followed. The principle, it is apparent, is in direct disaccord with the mechanical and fixed routine still characteristic of much of our educational practice. Studies are taught by themselves and for themselves as if there were no question of connection or of interdependence. In reality this may be shown almost everywhere to exist. History and geography, for instance, may be readily correlated by making the scene of a certain historical event, or series of events, the subject of instruction in geography; it is an easy matter to discover associations, again, between natural history and geography; arithmetic, in a similar way, may find fitting material in natural history, geography, and history. Three general plans for the co-ordination of studies have been recognized. (1) The subordination of most branches to a few important ones. There is no unanimity of opinion, however, as to what these branches should be. History and literature, according to Ziller, should furnish the logical core; others see in the sciences the central subjects. (2) The acceptance of universal scientific law as the basis for the co-ordination of studies. The real subjects, according to this theory, all logically connected, are furnished by the natural sciences and history, out of which all formal subjects, reading, writing, drawing, and the like, are to grow. (3) The co-ordination of independent branches through their natural relations. To every important group of subjects, under this system, is left its own particular principle of development, but a proper selection will bind all together by association.

3. Method. A system of education based upon psychological principles it is evident must embody methods of exposition which shall take full and accurate account of the conditions involved, such as the limitations in knowledge at any certain stage, the power of comprehension of the learner, his present acquirements, etc., and his interest in that which must constitute the subject-matter of his education in order that his mind shall be aroused to continued educational effort. There is, again, in this phase of pædagogy no general unanimity of opinion. What has been called the "gymnastic" system of education assumes that the mind can be trained by a minimum of concrete knowledge, and that the power gained in one department of knowledge may be transferred to any other; as, for instance, when in physics mathematics is made the basis of the work. This theory makes much of the so-called disciplinary studies; formal culture, or discipline of the mind, being held in view as a fundamental condition of education. The Herbartians, on the other hand, deny the correctness of the theory of mental discipline. They point out three necessary phases in the method of instruction as based upon the idea of apperception. Since all knowledge must start with the individual notion, a sound method must consider: (1) The assimilation of individual notions; as it is only possible to arrive at general laws through individual facts, (2) the inductive approach from individual to general notions; and, finally, since it is necessary for their proper utilization to apply these principles practically, (3) the return from general to individual notions. In the application of the details of method—whether knowledge shall be imparted objectively or by definition, whether descriptively or genetically, whether inductively or deductively, or whether methods with regard to the subject-matter shall be analytic or synthetic—the various systems of education are still widely apart.

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PEDAL (Lat. *pes*, a foot), any part of a musical instrument acted on by the feet. The pianoforte, the harp, and the organ are furnished with pedals, which, however serve an entirely different purpose in each instrument. In the pianoforte their object is to effect a change in the quality or intensity of the sound; the damper pedal prolongs the sound

after the finger is lifted from the key, and the shifting or *una corda* pedal softens the tone. The pedals of the harp are the means by which the chromatic changes of intonation are effected. In the organ the pedals are keys put in action by the feet. The division of the organ which is connected with the foot-keys is called the pedal organ, and contains the largest pipes. The introduction of pedals in the organ is assigned to a German of the name of Bernhard, who flourished in the 15th century. Pedals are also used in the organ to act on the swell and on the stops. See ORGAN.

PEDALIA'CEÆ. See BIGNONIACEÆ.

PEDAL-POINT, or PEDAL HARMONY. See ORGAN-POINT.

PEDEE', GREAT, a river of North and South Carolina, rises in the Alleghany Mountains in the n.w. of North Carolina, and running s. by e. flows through the e. portion of South Carolina, and enters the Atlantic through Winyaw Bay at Georgetown. It is navigable to Cheraw, 150 m., and is about 350 m. in length.—The LITTLE PEDEE, its principal eastern branch, is formed by the confluence of several smaller rivers in the s. part of North Carolina.

PEDESTAL, a base or block on which columns, statues, etc., are frequently set. The pedestal is much used in classic architecture. Like the column, it has a base and a sort of capital or cornice, called the surbase. The shaft, or plain block is called the dado or die.

PEDETES, or HEL'AMYS, a genus of rodent quadrupeds of the family *muridæ,* allied to jerboas, but differing from them in some of the characters of their dentition.

PEDICELLAR'IÆ are very remarkable minute appendages of the integuments of many of the echinodermata, having the form of a stalk, with a small two-bladed or three-bladed forceps at its summit. They are of a fleshy substance, with calcareous granules imbedded, and in a living state the blades are continually opening and closing. They were at one time supposed to be parasitic zoophytes, but are now generally believed to be organs of the star-fish or sea-urchin.

PEDICULA'RIS, a genus of herbaceous plants of the natural order *scrophulariacæ,* some of which have rather large and finely-colored flowers. Two species, *P. palustris* and *P. sylvatica,* are natives of Britain, common in wet grounds. Both have received the name of lousewort, the English equivalent of "pedicularis," from their supposed influence in producing the lousy disease in sheep; an influence purely imaginary. Their acridity renders them injurious to sheep which eat them. Continental Europe and the northern parts of Asia produce many other species, and some are found in North America.

PEDIC'ULUS. See LOUSE.

PEDIGREE (probably from Lat. *pes,* a foot), a tabular view of the members of a particular family with the relations in which they stand to each other, accompanied or unaccompanied by a notice of the chief events in the life of each, with their dates, and the evidence of the facts stated. Pedigrees are indispensable aids to the student of history. The wars of the Roses, the claim of Edward III. to the crown of France, the relative position of Mary and lady Jane Grey, the circumstances which brought about the union of the crowns of England and Scotland, the Sleswick-Holstein question, which occupied the attention of all Europe, and many other familiar chapters in the history of nations, as well as of families, cannot be read aright without the aid of pedigrees. The materials to be used in the formation of a pedigree are notes of the facts to be set forth, and a recognized series of signs and abbreviations. These notes comprise the name of every person who is to appear in the pedigree, with such dates and circumstances as it may be considered desirable to record. Among the commonest abbreviations are *dau,* for daughter of; *s.* and *h.,* son and heir of; *coh.,* coheir of; *w.,* wife of; *s. p.* (*sine prole*), without issue; *v. p.* (*vitâ patris*), in his father's lifetime; *b.,* born, *d.,* died; *dep.,* deposed; K., king; E., earl, etc. The sign = placed between two names, indicates that they were husband and wife. All persons of the same generation are to be kept in the same horizontal line; and the main line of descent is, wherever possible, to be indicated by keeping the successive names in a vertical column. Continuous lines indicate the succession of the different generations. The members of the same family are generally arranged in their order of birth in two groups—the sons first, and then the daughters; but where the same father or mother has children by more than one marriage, the children of each marriage ought to form distinct groups.

Tabular genealogies, generally brief, and meant to illustrate some particular claim of right, are found among the records, public and private, of the early middle ages; but after the incorporation of the English heralds' college, far more attention was devoted to the compilation of pedigrees of families, more particularly with reference to their claims to dignities and heraldic insignia. In the course of the 16th c. the heralds obtained copies of all such accounts of the English families of any distinction as could be supplied to them, and entered them in the books which contain the records of their official proceedings. Royal commissions were issued under the great seal to the two provincial kings-of-arms, empowering them to visit in turn the several counties of England, in order to collect from the principal persons of each county an account of the changes which had taken place in their respective families in the interval since the last preceding visitation, and to inquire what account could be given of themselves by families who had stepped into the rank of gentry, or had become settled in the county since that period. The reg-

ister-books kept by the heralds and their assistants contain the pedigrees and arms collected in the course of the visitations, with the signatures of the heads of the families. The pedigrees thus collected contain a vast body of information, interesting not only to the professed genealogist, but to every one who would know anything of the distinguished characters in English history. Some of these books are lost, the rest are scattered among the public and private libraries of the country, the largest collections being in the archives of the college of arms and the British museum. After the beginning of last century the visitations were discontinued, and there has since been no official and regular collection of pedigrees. A standing order of the house of lords in 1767 required that before any peer should be allowed to take his seat, garter-king-of-arms was to deliver at the table of the house of lords a pedigree of his family, to be verified by the committee of privileges, and eventually preserved in the records of the house, a copy being also registered in the college of arms. This order was rescinded by lord Thurlow in 1802, with the view of framing a new one; but, unfortunately, this was never done.

PEDIGREE, in point of law, is the legal relationship between individuals which is looked to with regard to the descent of property and honors. The occasion in which it comes into question is where a person dies, in which case his property, if he died intestate, is divided among those who are related by blood. The real property goes to one set of relations, and the personal property to others. See INTESTACY, KIN, NEXT OF.

PED'IMENT, the triangular space over the portico at the ends of the roof of classic buildings. It is inclosed by the horizontal and the *raking* cornices, the latter of which follow the slopes of the roof. The pediment may be called the gable of classic buildings. It is frequently enriched with sculpture, for which it forms a fine setting. The doors and windows of classic buildings are often surmounted by pediments, either straight-sided or curved.

PEDLAR, a magisterial district in Amherst co., Va., containing the village of Pedlar Mills, which is 15 miles n.e. of Lynchburg. Pop. '90, 4993.

PEDOBAPTISM. See BAPTISM, INFANT.

PEDOM'ETER, an instrument for measuring walking distances. It sometimes has a watch or clock attached. These instruments generally measure the number of steps taken by means of the movement of a suspended weight and the user must ascertain the average length of his steps in order to interpret the reading of the instrument. See ODOMETER.

PEDRO I. (DOM PEDRO D'ALCANTARA), Emperor of Brazil, was the second son of John VI., king of Portugal, and was born at Lisbon, Oct. 12, 1798. On the death of his elder brother in 1801, he became prince of Beja, and heir to the throne; and after his father's accession to the throne of Portugal and Brazil in 1816, he received the title of prince of Brazil. He was carried along with the rest of the royal family of Portugal in their flight to Brazil in 1807, and from that time remained in that country. His education, owing to political disturbances, was not carried on systematically, and after his arrival in Brazil, he was left to instruct himself very much according to his own inclination. In 1817 he married the archduchess Leopoldine of Austria, and on his father's return to Lisbon in 1821, was named regent of Brazil. At this time a great political crisis was impending; the Brazilians had been utterly disgusted at the preferment of Portuguese to the highest offices of state and the chief clerical dignities, and their discontent was heightened by the refusal of the Portuguese cortes to accord to Brazil a liberal constitution similar to that which had been granted to the mother-country, and by its arbitrary command, that Pedro, who was at the head of the liberal party, should at once return to Portugal to complete his education. Pedro, however, cast in his lot with the Brazilians, despite threats of exclusion from the throne of Portugal, and was chosen, Oct. 12, 1822, emperor of Brazil. His government was very vigorous, but a war which broke out between his supporters and the advocates of republicanism, distracted the country for a time, and prevented the liberal measures of the government from taking full effect. In 1825 his title was recognized by the Portuguese cortes; and the death of his father, in the following year, opened for him the succession to the throne of Portugal. This revived the national spirit of the Brazilian chambers, who feared that they were about to be again reduced to a dependent state, and Pedro's hasty and passionate temper led him to measures which whetted the general discontent. But he merely retained the dignity of king of Portugal long enough to show his right to it, and, after granting a more liberal constitution, immediately resigned in favor of his daughter, Maria II. The disturbances in Brazil still increased, the finances fell into disorder, the emperor's second marriage with the princess Amelia of Leuchtenburg displeased his subjects; and after making various ineffectual attempts to restore tranquillity, he was compelled, by the revolution of July, 1831, to resign the throne in favor of his son, Pedro II., a boy of 5½ years old. Pedro then sailed for Portugal, where his brother Miguel had usurped the throne; and with the aid of an army which was swelled by French and English volunteers, after a three years' campaign, he drove away the usurper, and restored his daughter to the throne in 1834. But the ceaseless excitement by which he had been surrounded, and the excessive demands on his energies, had produced total exhaustion, and he died Sept. 24, 1834. See BRAZIL; MIGUEL, DOM; and PORTUGAL.

PEDRO II. DE ALCANTARA, João Carlos Leopold Salvator Bibiano Francisco Xavier da Paulo Leucadio Miguel Gabriel Rafael Gonzaga, Dom, Emperor of Brazil, b. Rio Janeiro, Dec. 2, 1825; ascended the throne after the revolution of 1831 had compelled his father, Dom Pedro I., to abdicate, but was not crowned emperor until July 18, 1841. He married, Sept. 4, 1843, doña Theresa Christina Maria, daughter of Francis I., king of the Two Sicilies. The line has been continued through the marriage of the emperor's daughter Isabella, to Louis, count d'Eu, son of the duc de Nemours, to whom two sons have been born. The reign of Dom Pedro was generally marked by the exercise of wisdom and good judgment. He is a man of wide culture, and in 1876 was made associate member of the French academy of sciences. The progress of Brazil has been largely due to his enlightened views. In 1867 he opened the Amazon to the commerce of all nations, and in 1871 issued a decree authorizing the gradual abolition of slavery. He made extensive tours in Europe in 1876 and 1887 (his daughter acting as regent), and in the U. S. in 1876, where he assisted Pres. Grant in opening the centennial exhibition, and spent much time in visiting the principal cities and studying the American systems of government, education, etc. On Nov. 16, 1889, he was peaceably deposed, a republic having been proclaimed; and having agreed to accept a pension and go into perpetual exile, he embarked for Lisbon, Nov. 17. He d. 1891.

PEDUNCLE. See Flower.

PEEBLES. See Peeblesshire.

PEEBLESSHIRE, a co. in the s. of Scotland, also called Tweeddale from consisting mainly of the upper valley of the Tweed, a river which originates in the county. Peeblesshire is bounded by Dumfries and Selkirk shires on the s., Lanarkshire on the w., Mid-Lothian on the n., and Selkirkshire on the east. The county is small, containing 223,000 statute acres, of which 39,000 acres are under corn crops, and 22,000 under green crops. Its lowest point above the mean level of the sea is about 450 ft., from which to 1200 ft. is the region of cultivation; but the county, being a group of hills, is mostly pastoral, with the arable lands chiefly in the valleys. The highest hill is Broadlaw, which reaches an elevation of 2,754 feet. Within the county, the Tweed has for tributaries the small rivers Eddleston, Biggar, Quair, Manor, and Lyne, besides many mountain rivulets. The only town in the county is Peebles, an ancient royal burgh, pleasantly situated on a peninsula formed at the confluence of the Eddleston with the Tweed. The principal villages are Innerleithen, Walker Burn, West Linton, and Carlops. In 1891 the population of the county was 14,800, of whom 4,704 belonged to Peebles, which, distant 22 m. from Edinburgh, is the seat of a sheriff and county administration. Besides the parish church, the town has several dissenting places of worship, including an Episcopal and a Roman Catholic chapel. It likewise possesses some good schools, has branch banks, and a number of inns. As a means of literary and social improvement, Mr. W. Chambers, in 1859, made a free gift to this his native town of a spacious suite of buildings, comprising a reading-room, a public library consisting of 15,000 volumes, a museum, gallery of art, and a hall for lectures and concerts—the whole being designated the Chambers' Institution. Long secluded from general traffic, Peeblesshire has become a favorite summer resort from the climate and the Tweed fishings. The early Scottish kings lived here when hunting in the Ettrick forest. The woolen manufacture has made considerable progress in the parish of Innerleithen. Peeblesshire abounds in the remains of British hill-forts, border towers, and other antiquities, and possesses numerous modern mansions of a handsome kind.

PEEKSKILL, a village in Westchester co., N. Y.; on the Hudson river and the New York Central and Hudson River railroad; 42 miles n. of New York. It is in a region rich in memories of the revolution, and was incorporated in 1816. There are the Field library, Helping Hand hospital, military academy, Worrill hall, St. Gabriel's school, Mohegan Lake school, House of the Good Shepherd, opera house, the New York state military camp, waterworks, gas and electric lights, manufactories of stoves, fire brick, hats, underwear, and foundry facings, national and savings banks, and several newspapers. Pop. '90, 9,676.

PEEL, a co. in s. Ontario, Canada, on the n. shore of lake Ontario; watered by the Humber river, on the Grand Trunk and the Canadian Pacific railroads; 269 sq. m.; pop. '91, 15,466. Co. seat, Brampton.

PEEL, a seaport t. on the w. coast of the Isle of Man, and a favorite health resort. It was formerly called "Holm." Its cod fisheries are productive, but those of haddock and herring have declined. Beside fishing, the building of vessels of small tonnage, and the manufacture of nets are here carried on extensively, and form a source of large profits to the inhabitants.

At the northern extremity of this bay are several grotesque and romantic caverns. The southern extremity is formed by Peel island, on which stand the grand old ruins of Peel castle described in Scott's *Peveril of the Peak*. The castle was formerly the frequent residence of the earls of Derby, then lords of the Isle of Man, and is expressly named in the original grant of Henry IV. to the Stanley family. Beneath the cathedral is a strong subterranean dungeon, where many noble persons were in former days imprisoned. Population about 3500.

PEEL, Arthur Wellesley, b. 1829; youngest son of Sir Robert; received his education at Balliol coll., Oxford, where he graduated, 1852, and subsequently read law. He ran for parliament 1863, but failed of election; in 1865 he stood, as a Liberal, for Warwick; was elected, and has been in parliament ever since. In 1880 he was appointed under-sec. of state for the home dept., and in 1884 he became speaker of the house of commons, a position which he held till 1895.

PEEL, Sir Robert, a very eminent British statesman, b. Feb. 5, 1788, near Bury, in Lancashire. His father, sir Robert Peel (created a baronet in 1800), was a wealthy cotton-spinner, from whom he inherited a great fortune. He was educated at Harrow, and at Christ-church, Oxford, where he graduated B.A. in 1808—taking a double first-class—and entered the house of commons in 1809 as member for Cashel, adopting the strong tory politics of his father. Percival was then prime-minister. Peel set quietly about the business-work of the house, feeling his way with that steady prudence and persevering diligence that were the conspicuous features of his character. In 1811 he was appointed under-secretary for the colonies; and from 1812 to 1818 he held the office of secretary for Ireland. In this capacity he displayed a strong anti-Catholic spirit (whence the witty Irish gave him the nickname of "Orange-Peel"), and was in consequence so fiercely, or, shall we say, ferociously attacked by O'Connell, that even the cool and cautious secretary was driven to send the agitator a challenge. The police, however, prevented the duel from taking place. From 1818 till 1822 Peel remained out of office, but not out of parliament, where he sat for the university of Oxford. He now began to acquire a reputation as a financier and economist; and in 1819 was appointed chairman of the bank committee, and moved the resolutions which led to the resumption of cash-payments. He was still, however, as averse as ever to anything like religious or political reform. No member of the Liverpool-Castlereagh cabinet could have been to appearance more resolute. He even vehemently defended the infamous "Peterloo massacre" of 1819. In 1822 he re-entered the ministry as home secretary—Canning shortly after becoming foreign secretary, on the suicide of lord Castlereagh. The two worked together pretty well for some time, as Peel devoted himself chiefly to financial matters, and especially to the currency; but "Roman Catholic emancipation" was a question on which Canning was considerably in advance of his brother-secretary; and when the former was called upon by the king, after the resignation of lord Liverpool, to form a sort of whig-tory ministry, Peel, along with the duke of Wellington and others, withdrew from office. Yet it is sigularly characteristic of this most honest and *compromising* statesman, that even when he seceded (1827), his opinions were veering round to the liberal and generous view of the claims of Roman Catholics; and when the death of Canning, shortly after, led to the formation of the Wellington-Peel government, its great measure—actually introduced by "Orange-Peel" himself—was the ever-memorable one for the "relief" of the Roman Catholics (1829). As home secretary, he also signalized himself by a reorganization of the London police force—since popularly called "Peelers" and "Bobbies," their previous sobriquet being "Charlies"—from king Charles I., who (1640) extended and improved the police system—and by the introduction of several other important measures.

Meanwhile, the university of Oxford had rejected its apostate representative, and chosen in his stead sir Harry Inglis. But now came on the great question of parliamentary reform, which Peel firmly but temperately opposed. In 1830 the Wellington-Peel ministry fell, and was succeeded by a whig ministry under earl Grey, which, in 1832, carried the reform bill. Peel (now, by the death of his father, sir Robert Peel), when he saw that reform was inevitable, accepted defeat and its results with great equanimity. He shrank from anything like factious opposition to the measure, and contented himself with presenting as forcibly as he could the political *per-contra*. After it was passed, he became the leader of the "conservative" opposition; and, as we have said, accepting reform itself as a *fait accompli* and irreversible, he only sought by keen and vigilant criticism of whig measures to retard the too rapid strides of liberalism. In 1833, when the first "reformed" parliament assembled, Peel took his seat as member for Tamworth, which he represented till the close of his life. On the retirement of the Melbourne ministry in Nov., 1834, he accepted the office of prime-minister, but could not succeed in giving stability to his administration, and was compelled again to give place to viscount Melbourne in April, 1835, and resumed his place as leader of the opposition. Peel's conduct in opposition was always eminently patriotic. The whigs, who were being pressed on the one side by the new radical party and the anti-corn law league, and on the other by O'Connell and the Irish repealers, gradually lost ground, and being narrowly defeated in 1841, on a motion of want of confidence, dissolved parliament. The general election that ensued was virtually a contest between free-trade and protection. Protection won; and when the new parliament met, a vote of no-confidence was carried by a majority of ninety-one. The conservative party, headed by Peel, now came into office. The great feature of the new government was the attitude it adopted on the corn-law question. The whigs, while in office, and even after their expulsion, were bent upon a fixed but moderate duty on foreign corn; the anti-corn law league would hear of nothing short of an entire repeal, while sir Robert was in favor of a modification of the sliding scale of duty which had existed since 1828. He introduced and carried (1842), in spite

of strong opposition, a measure based upon this principle. The deficit in the revenue, which had become quite alarming under the Melbourne administration, next engaged his attention, and led him to bring in a bill (1842) for the imposition of an "income-tax" of 7d. in the pound, to be levied for three years. To alleviate the new burden, Peel commenced a revision of the general tariff, and either abolished or lowered the duties on several very important articles of commerce, such as drugs, dye-woods, cattle, sheep, pigs, salted meat, butter, eggs, cheese, and lard. He also showed himself resolute in the repression of the clamorous and anarchic malcontents of Ireland. O'Connell (q.v.) was tried for conspiracy, and though the judgment against him was set aside on appeal to the house of lords, the influence of the "agitator" was broken. The first half of 1845 was marked by the allowance to Maynooth being increased and changed into a permanent endowment instead of an annual grant, and by the foundation of the Irish unsectarian colleges, and other important measures. But the potato-rot in Ireland during the autumn, followed by a frightful famine, rendered "cheap corn" a necessity, if millions were not to starve. Cobden and the league redoubled their exertions. Lord John Russell announced the views of the whig party on the crisis, and Peel again yielded. He told his ministerial colleagues that the corn-laws were doomed, and that their repeal was inevitable. Some of them refusing to go along with him, he resigned; but after a few days, was recalled, and resumed office. Lord Stanley, the late lord Derby, seceded, and with lord George Bentinck, Mr. Disraeli, etc., formed a "no-surrender" tory party; but the duke of Wellington, Graham, Aberdeen, Gladstone, and other eminent conservatives, stood by him, and the measure for the repeal was carried. He was, however, immediately afterwards defeated on an Irish protection of life bill. Not so much upon this account, as because he felt that the course which he had pursued had produced a dissolution of the old ties of party, and that he could not expect for some time to find himself at the head of a strong government, Peel retired from office in June, 1846, giving place to a whig administration under lord John Russell, to which he gave an independent but general support as the leader of a middle party rather whig than tory. In the critical times of 1847–48, he was one of the most important props of the government, whose free-trade principles he had now completely accepted. His ecclesiastical policy had also undergone a remarkable change, and he now frankly supported the whigs in the efforts to carry an act for the repeal of the Jewish disabilities. He was himself regarded by the working and middle classes generally with much grateful respect. An unexpected catastrophe put an end to his career. On June 28, 1850, he had spoken with great eloquence in the debate on lord Palmerston's Greek policy; but on the following day was thrown from his horse in Hyde Park, and was so much injured that he died on the evening of July 2.—He left five sons, the eldest of whom, Sir Robert, the second, Sir Frederick, and the fifth, Jonathan, lieut.gen. in the British army, have all held offices as ministers.

PEELE, George, 1553–98; b. England; educated at Oxford. Coming to London he wrote for the stage, and sometimes acted. He was a friend of Marlowe, Greene, and Nash; lived the life of a literary adventurer; and Meres, in his *Palladis Tamia,* ascribes his death to debauchery. Six dramas are given in Dyce's edition of his works. *The Old Wives Tale,* in its subject, closely resembles Milton's *Comus.* His non-dramatic poems are chiefly speeches for pageants, or celebrations for public occasions.

PEEL-TOWER (W. *pill,* a stake, a fortress; Lat. *pila,* a stake, pillar, structure), the name given to the towers erected on the Scottish borders for defense. They are square, with turrets at the angles, and the door is sometimes at a height from the ground. The lower story is usually vaulted, and formed a stable for horses, cattle, etc.

PEEPLES, a township in Hampton co., S. Car., containing the towns of Brunson, Hampton, and Varnville; pop. '90, 5128.

PEEPUL, Pipul, or Pippul, *Ficus religiosa,* also known as the Sacred Fig of India, and in Ceylon called the Bo Tree; a species of fig (q.v.) somewhat resembling the banyan, but the branches not rooting like those of that tree, and the leaves heart-shaped with long attenuated points. The tree is held sacred by the Hindus, because Vishnu is said to have been born under it. It is generally planted near temples, and religious devotees spend their lives under its shade. It is also held sacred by the Buddhists. It attains a great size and age. The peepul is often planted near houses, and by the sides of walks, for the sake of its grateful shade. The juice contains caoutchouc, and is used by women as bandoline. Lac insects feed upon this tree, and much lac is obtained from it. The fruit is not much larger than a grape, and although eatable, is not valued.

PEER (Fr. *pair;* Lat. *par,* equal), a general name applied to the titled nobility of Great Britain and Ireland, indicating their equality of rank. The peerage includes the various degrees of baron, viscount, earl, marquis, and duke. The peers of England, of Great Britain, of the United Kingdom, and certain representative peers of Scotland and Ireland, together with certain of the bishops and archbishops, who are called lords spiritual, constitute the house of lords. The dignity of the peerage is hereditary, but in early times was territorial. Life peerages seem at one time to have been not unknown in England: but in 1856 sir James Parke, having been created by her majesty baron

Wensleydale "for and during the term of his natural life," the house of lords, on the report of a committee of privileges, held that he was not entitled to sit and vote in parliament. Ladies may be peeresses in their own right, either by creation or by inheritance. The wives of peers are also styled peeresses. Under the articles NOBILITY, PARLIAMENT, DUKE, MARQUIS, EARL, VISCOUNT, and BARON, will be found notices of each order of peers, and of the origin, history, and privileges of the peers as a body.

A certain limited number of the French nobility were styled peers of France.

PEET, HARVEY PRINDLE, LL.D., 1794–1873; b. Conn.; graduated at Yale college in 1822, and for nine years was the assistant of Rev. Thomas H. Gallaudet in the deaf and dumb asylum at Hartford, the first institution of the kind in this country. In 1831 he became president of the New York institute for the deaf and dumb. Dr. Peet was the author of a *Course of Instruction for the Deaf and Dumb,* and wrote many papers on the same subject and on insanity.

PEEWIT. See LAPWING.

PEFFER, WILLIAM ALFRED, was born in Cumberland co., Penn., Sept. 10, 1831, and is eminently a "self-made" man. In 1850 he went to California, and made considerable money; returning, he engaged in farming near Crawfordsville, Ind. During the civil war he did gallant service in the union army. After the war he studied law, practicing first in Clarksville, Tenn., and later in Kansas. In 1881 he assumed control of the *Kansas Farmer,* with which he has been connected ever since. He was elected U. S. senator, as a populist, in 1891.

PEGAU, a t. of Saxony, on the Elster, and 14 m. s.s.w. of Leipsic. Among other buildings it contains a beautiful Gothic church, with monuments to Count Wiprecht I., and to Prince Carl of Hesse-Hamburg, who fell in 1813 at the battle of Lutzen. The cloister of Pegau was founded in 1096 by Count Wiprecht, and after the papal interdiction restored again in 1539. Besides a hospital and town hall the town has breweries, turning and grain-mills, and manufactories of shoes, tobacco, tinware, etc. Pop. '95, 5084.

PE'GANUM, a genus of plants of the natural order *zygophyllaceæ,* of which the only known species, *P. harmala,* a half-shrubby plant with linear, smooth, almost bipinnatifid leaves, and solitary, white, axillary flowers, a native of the Levant and the n. of India, is sometimes cultivated in gardens under the name of SYRIAN RUE. The seeds are narcotic, and the emperor Solyman is said to have kept himself intoxicated by eating them. They were formerly used in medicine in Europe, and still are in the east. The Turks use them as a spice, and also for dyeing red. The plant is believed to be the *harmala* of the Greeks, mentioned by Dioscorides as one of the kinds of *peganon.*

PEG'ASUS, in Greek mythology, a winged horse which arose with Chrysaor from the blood of the Gorgon Medusa, when she was slain by Perseus. He is said to have received his name because he first made his appearance beside the springs (*pēgai*) of Oceanus. He afterwards ascended to heaven, and was believed to carry the thunder and lightning of Zeus. According to later authors, however, he was the horse of Eos. The myth concerning Pegasus is interwoven with that of the victory of Bellerophon over Chimæra. Bellerophon had in vain sought to catch Pegasus for his combat with this monster, but was advised by the seer Polyidos of Corinth to sleep in the temple of Minerva, and the goddess appearing to him in his sleep, gave him a golden bridle and certain instructions, upon which he acted, and made use of Pegasus in his combat with the Chimæra, the Amazons, and the Solymi. Pegasus is also spoken of in modern times as the horse of the muses, which, however, he was not. The ancient legend on this subject is that the nine muses and the nine daughters of Pieros engaged in a competition in singing by Helicon, and everything was motionless to hear their song, save Helicon, which rose ever higher and higher in its delight, when Pegasus put a stop to this with a kick of his hoof, and from the print arose Hippocrene, the inspiring spring of the muses. But that Pegasus is the horse of the muses is entirely a modern idea, being first found in the *Orlando Innamorato* of Boiardo.

PEGASUS, a genus of fishes, constituting the family *pegasidæ,* of the order *lophobranchii* (q.v.). The species are few; they are small fishes, natives of the Indian seas, interesting from their peculiar form and appearance. The breast is greatly expanded, much broader than high, the gill-openings in the sides; the pectoral fins are extremely large and strong; a long snout projects before the eyes, and the mouth is situated under and at the base of it; the body is surrounded by three knobbed or spinous rings. One species (*P. draco*) is called the SEA DRAGON, another (*P. volans*) is popularly known as the PEGASUS.

PEGLI, a t. in the province of Genoa, Italy, situated on the gulf of Genoa, 6 m. w. of the city of Genoa; pop. 4,000. It has fine hotels and bathing-houses for the accommodation of travelers, who resort hither on account of the fine climate, and the beauty of the place.

PEGS. Small square pointed pegs of wood have of late years been introduced by the Americans in the manufacture of boots and shoes, for the purpose of connecting the

parts of the sole and upper leather together without sewing. See SHOES. This invention has been so extensively adopted, that the manufacture of wooden pegs for this purpose has become an important trade in America and Bohemia, from which countries a considerable exportation is made to Great Britain. They are chiefly made of maple wood, and are rarely more than an inch in length.

PEGU', a former province of southern Burmah, lies between the parallels of 15° 14′ and 19° 27′ n. lat., and the meridians of 94° 13′ and 96° 52′ e. long. It had, in 1872, an area of 26,987 sq. m., and a pop. of 1,662,058.

At the census of 1881, however, it had been severed into two divisions, P. and Irrawadi, with other minor readjustments. P. contained in 1891 an area of only 2,428 sq.m. and a pop. of 301,000. The new division of Irrawadi had an area of 17,542 sq. m., distributed into the districts of Thongwa, Bassein, Henzada, and Thayetmyo, and a pop. of 1,552,000.

The river Pegu rises on the east slopes of the Pegu Yoma mountains, and flows s.s.e. and s.s.w. in the Rangoon. Its lower waters are used for irrigation, and the river is navigable by large vessels as far as Pu-zondaung. Other rivers are the Irrawadi, the Rangoon, the Pegu and the Sittaung. The township of P., n.e. of Rangoon, is intersected by the Pegu river. Pegu was annexed to British India at the close of the Burman war of 1852, after which time slavery ceased to exist, schools were established, and various public works undertaken.

Rice and teak timber are the principal exports. A flotilla of steamers keeps up the communication between Rangoon (q.v.), the principal port, and the chief stations on the Irrawadi, conveying troops, stores, passengers, and mails from place to place.—Winter's *Six Months in British Burmah* (Lond. 1858); Martin's *British India* (Lond. 1862).

PEGU, or BAGOO, a t. of Burmah, situated on the Pegu river, at its junction with the Irrawadi, 44 m. n.n.e. of Rangoon. It was described by European travelers in the 16th century as a place of great strength, size, and magnificence, but in 1757, the Burmese, invading the country, took Pegu, the capital, and razed it to the ground. It was rebuilt. The population is 10,800, of whom 8,500 are Buddhist. The streets are broad, paved with brick; the houses are built of wood, and raised on posts. The town was captured by the British in 1852. P. is also the name of the northeast "township" of the Pongoon district, containing the head-quarters town of P. The northwestern portion is mountainous and forest-clad; toward the south the hills diminish and the level land is covered with rice fields. Two-thirds in value of the exports of Burmah are shipped and almost all the imports are received at this port, which is third in importance among the British Indian seaports.

PEHLEVI (valor, power; *zabán pehlavi* = language of heroes) is the name of an ancient West-Iranian (Median and Persian) idiom, in use chiefly during the period of the Sassanides (235–640 A.D.), who, wishing fully to restore the ancient Persian empire, endeavored also to reinstate the primitive national language, fallen into disuse as a court language since the time of Alexander's conquest. Yet they did not fix upon the pure Persian as it was still spoken in the interior, but upon the dialect of the western provinces, largely mixed with Semitic words, to which Aryan terminations were affixed. The grammatical structure of the Pehlevi presents almost the same poverty of inflections and terminations as the present Persian. Although, however, less rich than Zend in inflection and accentuation, it yet boasts of the same copiousness of words as that dialect, to which it in reality succeeded. It is written from right to left, and the letters are mostly joined. The remnants of Pehlevi extant consist of coins, inscriptions (found at Hajiabad, Persepolis, Kirmanshah, etc.), and a number of books, all relating to the religion of Zoroaster. The most important of these are the translation of the chief part of the Zend-Avesta (Yazna, Visparad, and Vendidâd), and such original religious works as the Bundehesh, Shikandgumâni, Dinkart, Atash Barâm, etc. The Pehlevi of the books differs from that of the inscriptions and coins to such a degree—according to the larger or smaller preponderance of the Semitic element—as to have misled investigators (Westergaard and others) to assume that two utterly distinct languages, a purely Iranic and a Semitic one, had been used somewhat indiscriminately at the time. The non-Iranian element is called Huzvaresh (Huzooresh) by the Parsee priests, who, taking advantage of the ambiguity of the Pehlevi alphabet, often substitute the corresponding Persian for the foreign words. The Iranian part of the Pehlevi differs little from the Persian of our own day, and, in fact, the Pehlevi changed first into Parsee, and subsequently into modern Persian, simply by getting rid first of its Chaldee, and then of those of its Iranian words which had become obsolete. The chief use of the Pehlevi dialect at present is the assistance it offers towards the elucidation of the Zend itself. For the history of its investigation since it was first made known in Europe, we refer to PERSIAN LANGUAGE AND LITERATURE; and AVESTA.

PEI-HO' (white river), the largest river of China north of the Yellow river, is in the province of Pechili. Rising beyond the great wall, it flows in a southeasterly direction, passes to the east of Pekin, 60 miles below which it is increased by the tributaries Hun-ho, Huto-ho, Shang-ho and the Imperial Canal. Then passing by the treaty port of Tientsin, after a very tortuous course of 80 m. it enters the gulf of Pechili near Taku forts, the latter distance being but 35 m. by land. It is navigable for boats to

Pekin, 200 m. from its mouth, which is difficult of entrance on account of a bar. Total length, 280 m.

The attack on the escort of the British and French ambassadors, whilst ascending the Pei-ho to Pekin in June, 1859, led to the war with China of 1860. See CHINESE EMPIRE.

PEINE FORTE ET DURE, the "strong and hard pain;" a species of torture formerly applied by the law of England to those who, on being arraigned for felony, refused to plead, and stood mute, or who peremptorily challenged more than 20 jurors, which was considered a contumacy equivalent to standing mute. In the beginning of the 13th c., this penalty seems to have consisted merely in a severe imprisonment with low diet, persisted in till the contumacy was overcome. But by the reign of Henry IV. it had become the practice to load the offender with weights, and thus press him to death; and till nearly the middle of the 18th c. pressing to death was the regular and lawful mode of punishing persons who stood mute on their arraignment for felony. The motive which induced an accused party, in any case, to submit to this penalty rather than to plead, was probably to escape the attainder which would have resulted from a conviction for felony. During the 15th, 16th, 17th, and even the 18th centuries, various cases are recorded of the infliction of the punishment in question. Latterly, a practice prevailed which had no sanction from the law, of first trying the effect of tying the thumbs tightly together with whipcord, that the pain might induce the offender to plead. Among instances of the infliction of the *peine forte et dure* are the following: Juliana Quick, in 1442, charged with high treason in speaking contemptuously of Henry VI., was pressed to death. Anthony Arrowsmith, in 1598, was pressed to death (Surtees's *History of Durham*, vol. iii. p. 271). Walter Calverly, of Calverly, in Yorkshire, arraigned at the York assizes in 1605, for murdering his two children and stabbing his wife, was pressed to death in the castle by a large iron weight placed on his breast (Stow's *Chronicle*). Maj. Strangways suffered death in a similar way in Newgate in 1657, for refusing to plead when charged with the murder of his brother-in-law, Mr. Fussell. In 1720 a person of the name of Phillips was pressed in Newgate for a considerable time, till he was released on his submission; and the same is recorded in the following year of one Nathaniel Hawes, who lay under a weight of 250 lbs. for 7 minutes. As late as 1741 a person is said to have been pressed to death at the Cambridge assizes, the tying of his thumbs having been first tried without effect.

The statute 12 Geo. III. c. 20 virtually abolished the *peine forte et dure*, by enacting that any person who shall stand mute when arraigned for felony or piracy shall be convicted, and have the same judgment and execution awarded against him as if he had been convicted by verdict or confession.

PEI'PUS, or CHUDSKOYE LAKE, in the n.w. of Russia, is surrounded by the government of St. Petersburg, and the provinces of Esthonia and Livonia. On the s.e. it is connected with lake Pskoff by a strait 16 m. in length and from 1½ to 4½ m. broad. The length of both lakes is 87 m., the greatest breadth about 40, and the depth from 14 to 49 feet. Lake Pskoff receives the waters of the river Velekaia, and lake Peipus is supplied by lake Pskoff, and by the Embach from the w., and other rivers. The waters of the lower lake are carried to the gulf of Finland by the Narova. The lakes are studded with several picturesque islands and are surrounded with banks which are for the most part marshy. Fishing is the chief means of support for the nearly 25,000 inhabitants of its shores.

PEIRCE, BENJAMIN, LL.D., 1809–80, b. Mass.; graduated at Harvard in 1829; tutor there in 1831; university professor of physics and mathematics, 1833; and Perkins professor of astronomy and mathematics, 1842, which position he held till his death; in 1849 consulting astronomer to the *American Ephemeris* and *Nautical Almanac;* and in 1855 one of the council to organize the Dudley observatory, Albany. In 1867 he succeeded prof. A. D. Bache as supt. of coast survey, in which service he continued till 1874. In his early life he was a contributor to the *Mathematical Miscellany*, and also published the *Cambridge Miscellany of Mathematics, Physics, and Astronomy*, in which appeared his celebrated investigation of the motion of a top spinning on a plane surface. He also prepared a series of mathematical text books for the use of the university, and it was chiefly by his exertions that the Harvard observatory was established and perfected. In the first volume of the *Proceedings of the American Academy of Arts and Sciences*, he published a paper on the discovery of Neptune, in which he demonstrated that the mass, the distance from the sun, and the conditions of the planet itself differed from the conclusions of Leverrier and Adams, and that the discovery of Neptune by Galle nearly in the place indicated by Leverrier, although that astronomer's calculations were profound, was due to accident. This paper was followed by another, discussing the relations of Neptune to Uranus. In 1851 he published in the *Astronomical Journal* remarkable papers on the constitution of Saturn's rings, in which he considered the conditions of statical equilibrium of a transverse section of a ring, and came to the conclusion that if there are separate rings, they must be more numerous than Laplace had even supposed. From these deductions others have followed by other mathematicians, particularly Prof. J. Clerk Maxwell, which have resulted in considerable changes of view in regard to the Saturnian system. See SATURN. In 1857 he gave some of the most

brilliant results in analytical mechanics, in a volume which also contained many original demonstrations. Prof. Peirce made other important contributions to mathematics and physics, which will for a long time form the basis of future investigations by others. Among these may be mentioned his researches upon the personal equation, and his investigation of the forms of an elastic sac containing a fluid, a subject which led to the theory of analytic morphology. His contributions to algebra are of the broadest and profoundest character. They are principally embraced in certain communications on linear associative algebra, to the national academy of sciences, which had been suggested by the publication by Hamilton in 1852, of his "quaternions." These communications were collected in 1870, and 100 lithograph copies were published. This book is a marvel of profundity and mathematical genius. Prof. Peirce was made an associate of the royal astronomical society of London in 1849, and of the royal society of London in 1852. He was one of the original members of the national academy of sciences, and was a member of various learned societies in Europe and America.

PEIRCE, Bradford Kinney, b. Vt., 1819; graduated at the Wesleyan university, Middletown, Conn., in 1841; was pastor in Waltham, Newburyport, and Charlestown, Mass.; and in 1844 removed to Boston to edit the *Sunday School Messenger* and *Sunday School Teacher*. In 1855–56 he was a state senator, and afterward superintendent and chaplain of the state industrial school at Lancaster, which was established by his efforts. In 1863–72 he was chaplain of the house of refuge on Randall's island, New York, when he returned to Boston, and became editor of *Zion's Herald*. He has published *Notes on the Acts; Bible Scholar's Manual; The Eminent Dead; Trials of an Inventor; The Word of God Opened; A Half-century with Juvenile Delinquents.*

PEIRCE, Charles Sanders, b. Mass., 1839; graduated from Harvard college, 1859. He delivered lectures on logic and philosophy in Boston, and at Harvard in 1869, and was the author of "The Logic of Relatives" in the *Memoirs of the American Academy of Arts and Sciences*, 1870; and of a number of articles on logic, published in the *Journal of Speculative Philosophy*, also of a *Memoir on observation of Light of the Fixed Stars*, presented to the American academy in 1875. He was engaged later in the U. S. coast survey, where he conducted experiments relative to the earth's density.

PEIRCE, James Mills, b. Mass., 1834; son of Benjamin. He was educated at Harvard, was tutor in mathematics there 1854–58 and 1860–61, and became professor of astronomy and mathematics, 1885. He has published *A Text-book of Analytical Geometry*, *Elements of Logarithms*, and other works.

PEISHWA (minister) was the title of the personage third in rank and authority at the court of the Mahratta Maharajahs of Satara, there being only the *Priti-nidhi* (delegate of Rajah), between him and his sovereign. However, during the weak reigns of Sevajee's descendants, the minister increased in importance, till, at the commencement of the 18th c., Balajee Biswanath, the then Peishwa, and a man of distinguished administrative ability and diplomatic talents, made himself virtually the ruler of the Mahrattas (q.v.).

PEISISTRATOS. See Pisistratus.

PEKAN, or Wood-shock, *Martes Canadensis*, a species of marten (q.v.), very nearly allied to the sable, a native of the northern parts of North America. It is twice the size of the pine marten, and is generally of a grayish-brown color; the legs, tail, and back of the neck marked with darker brown. The fur, although not so valuable as sable, nor even as that of the pine marten, is useful, and large quantities are sent to the market. The pekan lives in burrows, which it excavates in the banks of rivers; and feeds chiefly on fish and other aquatic animals.

PEKIN', or Pe-king' (i.e., northern capital), the capital of the Chinese empire since 1421 A.D., is situated on a sandy plain about 13 m. n.w. of the Peiho, in lat. 39° 54′ 13″ n., and long. 116° 28′ 54″ e., in the northern province of Chih-le, at a distance of nearly 100 m. from the sea, and 36 m. from the great Chinese wall. The pop. of the city is estimated at about 1,000,000; and the circuit of the walls, according to the latest measurements, is 20 miles. These walls are made of earth, with an outer casing of brick, having embrasures for musketry or ordnance every 50 feet. Those of the Tartar city have an average height of 50 feet. In thickness they vary from 60 to 40 feet. The walls of the Chinese city are only 30 feet in height, and from 15 to 25 in width. The top, to which horsemen can ascend by a ramp or sloping way, is paved with stone. At intervals of 60 yards are square towers or buttresses, projecting outward from the walls 50 or 60 feet. The gates which give access to the city from the surrounding country are 16 in number, 9 of which belong to the northern or Tartar city, and 7 to the southern or Chinese city. Over each gate is a watch-tower 160 ft. in height, and loop-holed for cannon.

The city of Pekin is divided into two parts, separated by a wall with three gates. These two sections form respectively the northern, interior, or Tartar city, called *Neitching* ("within the walls"); and the southern, exterior, or Chinese city, called *Wai-*

*tching** ("without the walls"). "Tching" or "ching," it may be remarked, means both city and wall.

1. *Nei-tching, or the interior city*, has three distinct divisions or inclosures—viz.: Kin-tching, or the prohibited city; the Hwang-tching, or imperial city; and the general city. The first of these—the innermost or central block—is surrounded by a red brick wall about 2 m. in circumference, which shuts in the palaces, pleasure-grounds, and temples of the sacred city. Here live the emperor and his family, the ladies of the court, and the attendant eunuchs. The palace proper consists of four large and two small buildings, called the Tching-kung, or "*the* palace," the Tung-kung, Si-kung, and Kin-luan-teen. The smaller buildings are allotted to the dowager-empress and suite; they are called the Ning-shou-kung, and the Keen-tsing-kung, or the "palace of earth's repose." Other notable buildings of the prohibited city are Fung-seen-teen, the "temple of imperial ancestors;" Tching-hwang-meaou, the "guardian temple of the city;" Nan-heun-teen, "the hall of portraits of the Chinese emperors and sages;" and Wan-yuen Ko, the "hall of the literary abyss," i.e., the imperial library. It also contains the offices of the cabinet, in which the members hold their sessions, the imperial treasury, the court of controllers for the regulation of the receipts and expenses of the court, etc.—The imperial city is built around this central block, and contains the palaces of the princes, temples, some of the government offices, and spacious pleasure-grounds, with beautiful artificial lakes. From Woo-ying-teen, the imperial printing-office, the *Imperial* or *Pe-king Gazette* is issued daily for all government officials throughout the empire. This is the only publication in China approaching to a newspaper, and is named *King Paou*, or "great report." It is not merely a report for official information, but forms the basis of the national annals, and is compiled from the daily records of the supreme council. Besides the daily edition, there is one published every two days, which is sold to the public, and from which is withheld decrees and reports of a secret character. The general city—the third division or inclosure—lies between the imperial city and the outside walls; it is more densely populated than either of the preceding divisions, and contains the most important of the public offices, including the six supreme tribunals or boards—the Le-fan-yuen, or the office of foreign affairs; Too-cha-yuen, or the imperial censorate, etc.; Han-lin-yuen, or the grand national college, the great medical college, the observatory, the examination hall, with—it is said—10,000 cells for the candidates who assemble to compete for public offices; and the British, French, Russian, and United States legations. One may also notice the Lama temple, founded 1725–30 to conciliate the Thibetan priesthood; the temple of Confucius, in which the emperor solemnly "worships" the great sage once a year; and the Mohammedan mosque. In 1863 a college was founded for training interpreters, but this has since become the Imperial university on the European model, with printing-presses, etc. There is also a large Roman Catholic cathedral, finished in 1888, and a Greek church and convent. The principal streets of the general city—which is the most commercial—are continuous lines of shops painted red, blue, and green; decorated with staring signs, and resplendent with Chinese characters highly gilt. By day and by night, by the light of the sun, or by the illumination of torches and paper lanterns, the roar of these great thoroughfares is incessant, — shopkeepers, peddlers, mountebanks, quack-doctors, passengers on foot or on horseback, each and all contributing to the general hubbub. The minor streets and lanes, where the houses of the populace are mingled with public offices, temples, stores, and manufactories, are by no means pleasant places, their general characteristics being an "insupportable odor," and one-storied brick houses with roofs of a gray color. There is "Fetid Hide street," "Dog's-tooth street," "Dog's-tail street," "Barbarian street," and many others with names equally uninviting.

2. *Wai-tching*, or *the southern city*, the second great division of Pekin, contains most of the mercantile population of the capital, but does not present many features of interest to the traveler. Teen-tan, or the temple to heaven, and Tee-tan, or the temple to earth, with their grounds, occupy a considerable space. The latter is considered a sort of temple of agriculture, and its grounds are the scene of the well-known ceremony in which the emperor, assisted by members of the board of rites, opens the plowing season in China at the vernal equinox. The theaters and places of public amusement are likewise situated in the southern or Chinese city; also the golden fish-ponds, and the execution-ground.

The area of Pekin being greater than the population needs, there are gardens and open spaces in many parts of the city. Outside the city there are unwalled suburbs, as about every walled town in China. These are of considerable extent, but straggling, and consist principally of an agricultural population, the land being everywhere in a state of cultivation, producing chiefly maize and millet, as it is not so suitable for the staple products of rice and wheat. The land is badly watered but well timbered, which gives a pleasing aspect to the landscape; and when viewed toward the range of mountains

* Northern city and southern city are the most correct terms. The latter was added to the more ancient northern city, and was originally designed to encircle it; hence it was called the exterior city, in contradistinction to the northern or interior city. It was also intended to reserve the northern city for the Tartars, and the southern city for the Chinese, as the names still imply; but in point of fact, the Tartar city contains as many Chinese as Tartars; and it is not surrounded by the so-called Chinese city, which latter has only been added on the south side.

extending from the w. of Pekin to the n.e., presents a picturesque panorama. About 8 m. n.w. of Pekin the famous *Yuen-ming-yuen* (lit. "round and splendid gardens") palaces are situated, which were sacked and destroyed by the allies in Oct. 1860. These were surrounded by every variety of hill and dale, woodland and lawn, interspersed with canals, pools, rivulets, and lakes, with numerous temples and pagodas containing statues of men and gods in gold, silver and bronze. Here had been heaped up for centuries all the movable riches and presents of the emperors of China. At the approach of the allies, Hien-fung fled in haste; and when lord Elgin learned that it was in those grounds that the British and French prisoners, captured by treachery, had been tortured, he gave the order to sack and destroy this favorite residence of the emperor's, "as it could not fail to be a blow to his pride as well as his feelings."

Pekin has thus been rendered memorable by this march of the British and French forces (1860) to the walls of the city, on which the British and French flags were raised. The provisions of the treaty of Tien-tsin 1858 (see CHINESE EMPIRE) were ratified and supplemented by the *Convention of Pekin*, which was signed in the English and French languages at Pekin, Oct. 24, 1860. The most important article of this convention is that which allows the residence of a British envoy at Pekin, a privilege formerly enjoyed by Russia alone. The greatest benefits have resulted to both governments by this step. The same privilege has been granted to the French and American governments. Foreigners of all nations are allowed to visit, but not to trade within the precincts of the city. Pekin has a healthy climate and there is a good water supply and no marshes in the vicinity.

Pekin is a very ancient city. Centuries before the Christian era, it was the capital of the kingdom of *Yen*, but when this kingdom was overthrown by the *Tsin* dynasty in 222 B.C., the seat of government was removed elsewhere. About 938 A.D. it again became the capital of the *Kitan* dynasty. In 1215 it was captured by Genghis Khan, and in 1264 Kublai Khan (whom readers of Coleridge will remember) fixed his residence here. The native emperors, however, who succeeded the Mongol dynasty, removed the court to Nankin, which was reckoned the chief city of the empire till Yung Lo, the third emperor of the Ming dynasty in 1421, once more made it the imperial residence, which it has ever since remained. See *Yedo and Pekin*, by Robert Fortune (Lond. 1863), *Macmillan's Magazine* (Jan. 1861), Rennie, *Pekin and the Pekingese* (1865), Jametel's *Souvenirs de l'Empire du Milieu* (1887).

PEKIN, city and co. seat of Tazewell co., Ill.; on the Illinois river and the Cleveland, Cincinnati, Chicago, and St. Louis, and several other railroads; 32 miles w. of Bloomington. It has gas and electric lights, electric street railroad, waterworks, national and private banks, Artesian Well park of 40 acres, public library, high school, manufactories of high wines and alcohol, agricultural implements, flour, brick and tile, wagons, organs, and iron and brass goods, and, in the vicinity, large veins of excellent coal. The city is in a noted corn region, is a large general grain market, and is an important shipping point by rail and water. Pop. '90, 6,347.

PELA'GIANISM, the doctrinal system of Pelagius (q.v.), especially on the subjects of the natural condition of man, original sin, grace, free-will, and redemption. Under the head PELAGIUS will be found what may be called the external history of the controversy to which the opinions of that remarkable man gave occasion. The movement, considered in itself, is one of the most interesting in the history of the human mind. At the close of the great controversies on the Trinity and Incarnation, the speculation, which for nearly a century had wearied itself in vain endeavors to make plain the inscrutable mysteries of the divine nature, at length turned inwards upon itself; and no one at all familiar with the controversy on Pelagianism can doubt that that prouder view of the capabilities of human nature, which lies at the root of all the theories of which Pelagianism was but the exponent, was a reaction against the crude and degrading conceptions of the nature and origin of the soul which characterized the philosophy, not alone of the Manichæan teachers, but of all the dualistic religions which sprung from the prolific soil of Gnosticism. To the Manichæan, and to all in general who adopted the Gnostic views as to the evil origin and nature of matter and material substances, man was, in his *psychical* nature, evil and incapable of good. The Christian teacher, in combating this view, easily passed into an opposite extreme, and overlooking or explaining away the strong language of the Scripture, was led to represent man as endowed with full capacity for all good; and so long as the only adversaries to be controverted were those who urged the views of the Gnostic school, the line taken by Christian writers was but little guarded by any of those limitations and reserves which have arisen in later controversy; and thus the earlier fathers, especially those of the eastern church, where Gnosticism was chiefly to be combated, are found to press earnestly the power for good which man possesses, without entering nicely into the origin or the motive principle of that power. But whatever of vagueness hung over this important subject was dispelled by the bold and precise statements of Pelagius, or at least by the discussion which at once arose thereupon, throughout the entire church. His teaching on the subject of original sin and on the primitive state of man has been already detailed. See ORIGINAL SIN. The earliest formal embodiment of these doctrines, for the purpose of obtaining upon them the public judgment of the church, was in a number of articles presented to the council of

Jerusalem, in 415, by Orosius. See PELAGIUS. Of these the first five regarded the doctrines already noticed under ORIGINAL SIN. The latter portion of the articles alleged that no grace or aid from God was needed for particular actions, but that free-will and the teaching of the law sufficed; that God's grace is given in proportion to our merits; that free-will would not be free, if it stood in need of aid from God; that the pardon of penitents is not granted according to God's grace and mercy, but according to their own merit and labor; and that our victory does not come from God's assistance, but from our free-will. Although the final sentence condemnatory of these doctrines (see PELAGIUS) was very generally accepted, yet the recusant party was not wanting in energy and ability. The great champions on each side were Augustine for the orthodox, and Julianus, bishop of Eclanum, for the Pelagians. Of so much of the controversy as regards original sin, the history has been already related; that on grace and free-will was more subtle, and has led to more numerous divisions on the side of orthodoxy as well as of dissent. In order to evade the condemnation of the doctrine originally ascribed to them as to grace, Pelagius and his followers declared that they did not deny the necessity of grace; but by this name they did not understand any real and internal supernatural aid given by God in each particular action, but only either some general external assistance, such as preaching, the Scriptures, good example, etc., or an aid given which might facilitate and secure the particular work, but which was by no means necessary for its accomplishment. Whether, indeed, they at any time admitted any real internal grace, is a question much disputed. Grace is of two kinds—that which moves the will, and that which enlightens the understanding. It is necessary, too, to distinguish two periods in the history of Pelagianism—one before the appearance of the *Epistola Tractoria* of pope Zosimus; the other subsequent to that decree. In the first period it would seem that the Pelagians did not admit the necessity of any internal grace whatever; in the latter they admitted the necessity of a grace of the intellect, but not of the will; or if they seemed to speak of any internal grace of the will, it was only as facilitating man's act, not as at all necessary to his doing it. The Pelagian theory, in a word, was, that man, as coming from his Creator's hand, possessed in himself, and as constituents of his own nature, all the powers which are necessary for the attainment of salvation; that by the faithful employment of these natural powers, without any further aid whatever from God, he merits eternal life, and all other rewards, by a strict title of justice; and that, to suppose grace to be necessary, is in truth to destroy the essence of free-will. This doctrine was somewhat modified in the semi-Pelagian system (q.v.). The Catholic schools, all without exception, maintain the necessity of grace for the performance, not only of all meritorious, but of all supernatural good works; and they are equally unanimous in maintaining that the grace so given, even that which is called "efficacious," does not destroy the freedom of the will. They distinguish between the "natural" and "supernatural" order, and between the powers and gifts which are proper to the one and to the other. For the attainment of all the ends of the natural order, man possesses, by his very constitution, all the powers and all the gifts which are necessary; and by the proper use of these powers, he is able to merit all the rewards which belong to the natural order. He is able, therefore, without any supernatural grace, to perform morally good works (as acts of natural benevolence, the fulfillment of the ordinary duties to his neighbor, etc.), and to fulfill the purely natural obligations. But in order to works in the supernatural order (such as the love of God above all things for his own sake, faith in him as the author of all good, etc.), and the rewards which are promised for such works, the will of man must be moved and strengthened by supernatural grace, with which the will freely co-operates, but which is a purely gratuitous gift of God—so purely gratuitous, that although God has promised eternal life as the reward of man's co-operation, yet the merit arises entirely from God's gift and promise, and not from the natural powers of the human will.

Without going into the details of the teaching of the Catholic schools, it will be enough to particularize the most remarkable among them. Of these the chief are the Molinist, which, giving most to liberty, lies nearest to the border of Pelagianism, but is clearly distinguished from it by maintaining the necessity of grace for every supernatural act; and the Thomist and Augustinian, which give most to grace, but at the same time expressly preserve the freedom of man's will. The Thomists are often represented as denying the freedom of man's actions under grace; but although it is difficult to explain, in popular language, their method of reconciling both, yet, to those acquainted with the scholastic terminology, their distinction between the infallible efficaciousness of grace, and its imposing necessity on the will, is perfectly appreciable. In this they, as well as the Augustinian school, differ from the Jansenists (see JANSEN). The Jansenists, indeed, regard the Molinist school as a plain revival of Pelagianism, and they profess that they alone represent fully, in their own system, the very same position which St. Augustine formerly maintained against that heresy in its first origin.

In the Reformed church the Arminian doctrine may be said to correspond in the main with the Molinist system in the Roman church. The Gomarists, in most, although not in all, particulars, fall in with the Jansenistic views. The Pelagian views are distinctly represented in modern controversy by the Socinians and rationalists; and indeed

very many of those who, outside of the Roman church, have at various times engaged in the predestinarian controversy on the side of free-will, have leaned towards, if they have not fully adopted, the Pelagian view. In this controversy, however, the practice, which is not uncommon in polemics, of imputing to an antagonist the extremest views of the particular side to which he leans, has been specially noticeable. The Jesuits have been stigmatized, even by their Catholic antagonists, as Pelagians; the Thomists are called by the Jesuits indiscriminately Jansenists and Calvinists, while both unite in representing Calvin and his school as in substance Manichæan.

Hardly one among the many Christian controversies has called forth a greater amount of subtlety and power, and not one has so long and so persistently maintained its vitality. Within the 25 years which followed its first appearance upwards of 30 councils (one of them the general council of Ephesus) were held for the purpose of this discussion. It lay at the bottom of all the intellectual activity of the conflicts in the mediæval philosophic schools; and there is hardly a single subject which has come into discussion under so many different forms in modern controversy. See JANSEN, ARMINIUS, GRACE, PREDESTINATION, ORIGINAL SIN, TRADUCIANISM.

PELA'GIUS, a celebrated heresiarch of the 5th c., author or systematizer of the doctrine known as Pelagianism (q.v.). Of his early life little is known. He was probably born about or before the middle of the 4th c., in Britain, or, according to some, in Bretagne, his name being supposed to be a Greek rendering (*Pelagios*, of or belonging to the sea) of the Celtic appellative *Morgan*, or sea-born. He was a monk, but the time and place of his entering that state are unknown; it is certain, however, that he never entered into holy orders. He settled in Rome, and at the end of the 4th c. he had already acquired a considerable reputation for sanctity and for knowledge of the Holy Scriptures and the spiritual life. Pelagius does not appear to have himself been a very active propagandist; but he had attached to his views a follower of great energy, and a bold and ardent temper, named Celestius, who is generally supposed to have been a Scot, which, in the vocabulary of that age, means a native of Ireland. At Rome, however, they attracted but little notice, although they began to make their doctrine public about 405; and in 410, after the sack of the city by the Goths, they withdrew to Africa. After some time Pelagius made a pilgrimage to Jerusalem, where he met St. Jerome, and for a time enjoyed the regard and confidence of that eminent but hot-tempered scholar. His opinions, however, becoming known, Jerome withdrew from this association. Celestius having remained at Carthage, and sought to be admitted to ordination, his doctrines became the subject of discussion, and in a synod several opinions ascribed to him were condemned. He appealed to Rome, but leaving Carthage without prosecuting the appeal, he passed to Ephesus; and the proceedings taken in Carthage regarding him are chiefly important as having first introduced St. Augustine into the controversy. Meanwhile Pelagius remained at Jerusalem, and news of the proceedings at Carthage having been carried to Palestine, Pelagius, in 415, was accused of heresy before the synod of Jerusalem by a Spaniard named Orosius. The impeachment failed, probably from the fact that Orosius was unable to speak Greek, the language of the synod; and in the synod subsequently held at Diospolis in the same year, Pelagius evaded condemnation by accepting the decrees of the synod of Carthage already referred to, and even obtained from the synod an acknowledgment of his orthodoxy. The west, however, was more sharp-sighted or less indulgent. A synod of Carthage, in 416, condemned Pelagius and Celestius, and wrote to Pope Innocent I., requesting his approval of the sentence, with which request Innocent complied by a letter which is still extant. On the death of Innocent, Celestius came to Rome in person, and Pelagius at the same time addressed a letter to Zosimus, the successor of Innocent; and in a council which Zosimus held, Celestius gave such explanations that the pope was led to believe that the doctrines of Pelagius had been misunderstood, and wrote to call the African bishops to Rome. A council of 214 bishops, however, was held in Carthage, in which the doctrines of Pelagius were formally condemned in nine canons, which were sent to Rome with full explanations; and on receipt of these decrees Zosimus reopened the cause, cited and condemned Celestius and Pelagius, and published a decree, called *Epistola Tractoria*, adopting the canons of the African council, and requiring that all bishops should subscribe them, under pain of deposition. Nineteen Italian bishops refused to accept these canons, and were deposed. Their leader, and the person who may be regarded as the greatest theological advocate of Pelagius in the ancient controversy, was the celebrated Julian, bishop of Eclanum, near Beneventum, who is well known to every reader of his great antagonist, St. Augustine. Pelagius himself was banished from Rome, in 418, by the emperor Honorius. From this date Pelagius disappears. Of his after life nothing is known in detail. Orosius gives an unfavorable account of his later career, but in a period of such excitement we may not accept implicitly the judgment of an adversary. The controversy, considered as an exercise of intellectual energy, is the most remarkable in the ancient history of the church. But the most important of the writings on the Pelagian side have been lost. Julian is chiefly known through the replies of Augustine. Pelagius's *Fourteen Books of a Commentary on St. Paul's Epistles*, his *Epistle to Demetrius*, and his *Memorial to Pope Innocent* have escaped destruction probably from their being included by collectors in the works of St. Jerome. They are much mutilated, but yet

almost certainly genuine. All his other works have been lost, except some further portions, chiefly fragmentary, which (with the above) have been published under the title of *Appendix Augustiniana*. After his banishment Pelagius is supposed to have returned to his native country, and to have died there. Others, however, represent him as having died in Palestine. Of his doctrines in detail an account will be found under PELAGIANISM.

PELAGO, a t. in Italy, province of Florence, 13 m. n.e. of Florence. It manufactures earthenware and woolen cloths; population less than 2,000. Vallombrosa, the richest convent in Tuscany is in this commune.

PELARGO'NIC ACID, or Nonylic Acid, $C_9H_{18}O_2$, is one of the volatile fatty acids of the general formula $C_nH_{2n}O_2$. It is an oily fluid, nearly insoluble in water, but soluble in alcohol and ether. It derives its name from its having been originally obtained from the leaves of *pelargonium roseum* (see next article) by distilling them with water. It may also be obtained by the oxidation of oleic acid or of oil of rue by nitric acid. The ethyl pelargonate, $C_2H_5 \cdot C_9H_{17}O_2$, is an oily fluid of a very peculiar smell. According to Frankland, it is to this compound that old whisky owes its peculiar flavor; and its addition to new whisky, with a view of giving it an old flavor, is not uncommon.

PELARGO'NIUM, a genus of plants of the natural order *geraniaceæ*, including many of the most favorite green-house flowers, to which the old generic name *geranium* is often popularly given. The characters which distinguish pelargonium from geranium, as now restricted by botanists, are given in the article GERANIUM. The species are numerous, and mostly s. African; Australia also producing a few. Some of them are herbaceous, and some are stemless; most of them are half-shrubby. Some have tuberous root-stocks. The leaves exhibit great variety in form, division, etc. The flowers always adhere to a certain type in form, but with great variety in size, color, etc.; they are always in stalked umbels, which arise from the axils of the leaves, or in the stemless kinds from the midst of the leaves. In no genus has the art of the gardener produced more striking results than in this; and the number of beautiful hybrids and varieties is very great, some of them excelling in beauty any of the original species. Some species, not possessing much beauty of flower, are cultivated for the grateful odor of their leaves, which in some resembles that of roses; in others, that of apples, lemons, etc.; whilst that of many species is rather unpleasant. The cultivation of pelargoniums is similar to that of other *geraniaceæ*. See GERANIUM. A few of the species endure the open air in the s. of England; many are planted out in summer even in Scotland. Water must be liberally supplied to pelargoniums during the time of flowering; but no plants more strongly require a period of rest, and water must then be very sparingly given. Many of the shrubby kinds may be taken out of the soil, hung up by the roots in a dry dark cellar, or covered with hay, and put aside in a box, in a cool dry loft or garret, care being taken, however, to protect them from frost. Every leaf should be removed before they are taken up, and young watery shoots should be cut off. Another method of treating them is to cut off every leaf before frost comes, and to keep the plants all winter in their pots in a dry cool room, without giving them a drop of water. By such means many of this beautiful genus are successfully cultivated by persons who have no green-house.

PELAS'GIANS, variously explained as denoting either "swarthy Asiatics" (*Pell-Asici*) or "storks" (*pelargoi*)—significative of wandering habits; or as being derived from the biblical *peleg* (Gen. x. 25), from the Greek *pelagos* (the sea), *pelazo* (to approach), or *pelein* and *agros* (to till the field), etc.—"a name, in fact," as Niebuhr says, "odious to the historian, who hates the spurious philology out of which the pretenses to knowledge on the subject of such extinct people arise"—designates a certain tribe or number of tribes who inhabited Italy, Thracia, Macedonia, a part of Asia Minor, and many other regions of southern Europe, in prehistoric times. Ethnologically, they belong to the same race as the great stock of the earliest known settlers, that reached from the Po and the Arno to the Rhyndakus (near Kyzikus). Yet no Pelasgian town or village existing in Greece proper after 776 B.C., speculation has, ever since the commencement of European historiography, been busy trying to supply the facts that were wanting to ascertain the exact origin and history of these predecessors of the Hellenes and Romans; and so futile have all efforts in this direction remained, that the very term Pelasgi has, from the days of Homer to our own, been used almost arbitrarily to designate either a single obscure division of a tribe like the Leleges and the Dolopes, or as an equivalent for all the Greeks of a very early period. In this latter sense, they are spoken of by Æschylus, Herodotus, Homer; while they are considered one of the branches of the race or races that peopled Greece, by Thucydides, Strabo, and most modern writers, the word thus not being a comprehensive term, like Aryan, but a narrowly circumscribed one, like Hindu. Recent investigation seems, as regards their previous history, to lead to the result, that soon after the first immigration of Turanians, they, like other tribes, left their Asiatic homes, and proceeded toward Europe. They are found at a very early period settled in Asia Minor; and Homer speaks of them as allies of the Trojans. They then seem to have spread themselves, by way of the Propontis and Ægean, and again by Crete, over many of the islands between the two continents; and finally, came to occupy a great part of the Hellenic main-land—Thessaly, Epirus, the Peloponnese, Attica, Macedonia, Arcadia,

provinces which, one and all, up to the latest period, bore distinct traces of the once undisputed sway of the Pelasgians. According to Herodotus, the Hellenes themselves sprang from them; and there can hardly be a doubt that they formed a most important element in the formation as well of that most gifted of nationalities as of the Latin people. The early Etruscans (see ETRURIA) were Pelasgians to a certain extent; and the southern tribes of the Peucetians, Œnotrians, and Iapygians are distinctly declared by ancient writers to belong to their race. The step from Greece into Italy is natural enough. What caused their wanderings originally is difficult to conjecture; but it may not unreasonably be assumed that they were caused to a certain extent by immigrations of eastern tribes, such as the Lydians, Phrygians, Carians, who pushed them further and further west, as they took possession of their old homes. A special stock was formed by the Tyrrhenian Pelasgi, whose gradual advance in Greece may be traced from Acarnania to Bœotia, thence to Attica, and later still, to the Hellespont, Lemnos, etc. A strong protest, however, must be recorded here on the part of some modern writers against the assumption of others, that the Pelasgians were in reality the original population of all Italy, as they were of the greatest part of Greece (Pelasgia). It is absurd, they argue, to suppose that a rich and populous nation, which had held a country like Italy for many centuries, should suddenly, just at the approach of historical times, die out without leaving even such single remnants as the Pelasgic settlements in Greece mentioned by Herodotus. These aboriginal Italian Pelasgians are, according to them, neither more nor less than a mere hypothesis of ignorant ancient writers, who wished to explain the ethnological and philological affinity between the two classical nations in an easy manner, and who, anticipating the questions about a contemporary colony, kill the whole nation off by pestilence and famine.

The Pelasgians, from what we can glean about them, would appear to have been a highly intellectual, receptive, active, and stirring people, of simple habits withal, chiefly intent upon agricultural pursuits. Several improvements in this province were distinctly traced back to them, such as the plowing with oxen—for which purpose they had to invent the special goad; further, the art of surveying, and the like. Yet they were no less warlike when attacked and driven to self-defense; and the trumpet, which calls the widely scattered troops to the attack, was supposed to have been first used by them. That the art of navigation was well known to them is shown sufficiently by their incessant migrations over sea and land. Of their architecture, in that style which, in default of a better name, has been called Cyclopean (q.v.), remnants are still existing. The names Larissa, Argos, Ephyra, frequently met in ancient Greece, were bestowed by them upon their fortified cities, and are only generic names, expressive of either mountain fortresses or strongholds in plains. Wishing to remain in peace, they endeavored to keep off the invader by walls so enormously strong that it really seems most surprising how they ever could have been taken. Besides these, they built canals, dams, and subterranean water-works of astounding strength and most skillful construction. The tomb or treasury of Atreus at Mycenæ was vaulted with a fine pointed "horizontal arch," 48½ ft. in diameter. Of their sculpture, which they no doubt likewise cultivated to a certain degree, we have but very small relics, such as a head of Medusa, and a *Xoanon* (divine image) of Orpheus; besides these, certain traces of their special mystic worship are to be found in archaic representations, which, though not hitherto ascribed to them, bear their direct influence upon their very face. How far they were either the inventors of the so-called Cadmean or Phenician writing-characters, from which all European characters are derived, or merely their "improvers," is not to be decided by the contradictory evidence to be found on the subject: but this, at all events, is certain, that they were acquainted with the art of writing, and had thus a vast element of culture in their possession before the dawn of history. Respecting their religion and worship, there is this only to be held with certainty, that it originally consisted in a mystic service of those natural powers, whose influence is chiefly visible in the growth of the fruits of the earth. From Egypt they obtained names for their till then nameless gods, generally called by them the Theoi; and they proceeded—by permission of the Dodonic oracle, which, together with the Pythian, they first founded—to bestow them upon them individually. Their deities were, besides the Phenician Kabiri, Demeter, Persephone Kora, Dionysos, Hermes, Zeus of Dodona, Apollo, Hephæstus, Themis, Pan, etc. Whether those Pelasgians who inhabited Lemnos and Imbros, and who were conquered by Darius, offered up human sacrifices or not, is doubtful. An ambiguous term of Herodotus respecting the language of those small Pelasgian remnants who had survived to his day, has given rise to endless and most unsatisfactory discussions. He speaks (i. 57) of their "barbarous language;" and the question is, whether he meant that it completely differed from Greek, or that there was only so vast a divergence of dialect, that it had become unintelligible to his contemporaries. Grote inclines to the former opinion; Niebuhr, Thirlwall, T. O. Müller, followed by G. Rawlinson and others, hold, with more apparent show of reason, that the term "barbarous language" merely indicates a corruption or alteration of idiom, such as a long lapse of time would infallibly produce, and that it bore the same relation to the Greek of the day as the Gothic does to the German, or the Latin to any of the Romance languages, not to instance the forlorn patois of out-of-the-

way places in Switzerland and elsewhere, supposed to be inhabited by unmixed descendants from Roman legions. That other phenomenon of the vast number of roots common both to Greek and Latin—the latter, it must be remembered, having been proved to be derived, not from the former, but from the Oscan—would thus easily be explained by the assumption of a common Pelasgian linguistic (as well as ethnical) stock in both nationalities.

Their political circumstances are as unknown to us as the whole process of transition between them and the real Greek period. From a few scattered allusions, we may conclude that they were not uniformly governed; that some of their multifarious tribes were ruled by priests, while others stood under the patriarchal rule of the head of the clan or family.

How they gradually disappeared from the rank of nations, by being either "absorbed" by superior races (Hellenes, Italici, Carians, Lydians, Phrygians), or being reduced to nameless serf-populations, does not seem so difficult to understand as some writers would have it. Hundreds of nations have disappeared in the same manner, and we may even watch the process with our own eyes. Interesting as it might be to dwell more minutely on some of the widely divergent theories and speculations upon the Pelasgians on the part of historians, philologists, ethnologists, antiquaries, and investigators generally, to whom, at all times, this people proved exceedingly attractive, we cannot enter any further upon them here, but we shall conclude with Grote's dictum: "If any man is inclined to call the unknown ante-Hellenic period of Greece by the name of Pelasgic, it is open to him to do so. But this is a name carrying with it no assured predicates, no way enlarging our insight into real history, nor enabling us to explain what would be the real historical problem—how, or from whom, the Hellenes acquired that stock of dispositions, aptitudes, arts, etc., with which they begin their career."

PELA'YO, said by historians to have been the first Christian king in Spain, after the conquest of that country by the Arabs. Contemporary historians make no mention of him, but this may be accounted for on the ground of the insignificant size of his kingdom, which comprised only the mountainous district of Asturias. He is said to have been a scion of the royal Visigothic line, and to have retired before the conquering Arabs to the mountains of Asturias, where he maintained himself against the armies which were sent to attack him, defeating them in various pitched battles, and in numberless minor engagements. One of his most famous exploits was the destruction of a large army sent against him by Tarik, near Cangas-de-Onis. His men were posted on the heights bounding the valley through which the Arabs were to pass, and, waiting till the enemy had become involved in the defile, at a given signal, overwhelmed them with enormous masses of rock. This great success caused Pelayo to be recognized as sovereign by the surrounding districts, and the Christians flocked to him from all parts of Spain. He was much engaged in contests with the Arabs, but nevertheless found time to reanimate agriculture, superintend the reconstruction of churches, and the establishment of a civil administration. He died in 737. Such is the account given us by later historians, who trace from him the genealogy of the royal family of Spain.

PELECAN'IDÆ, a family of palmiped birds, the *totipalmati* of Cuvier; characterized by a long, straight, compressed bill, broad at the base, often with a pouch beneath the lower mandible; long wings, of which the first quill is the longest; short strong legs, and all the toes—including the hind toe—united by a membrane. They are generally excellent swimmers, expert divers, and birds of powerful flight. Some of them often perch on trees, which few other web-footed birds do. To this family belong pelicans, cormorants, frigate-birds, tropic-birds, and darters.

PÉLÉE ISLAND, a large island of lake Erie in long. 82° 40′ w. is within the Canadian line, about 6 m. northward of the Put-in-bay group; and 10 m. s.w. of Point au Pélée on the n. shore mainland. It contains about 13,000 acres; is 9 m. long from n. to s., and 4 m. wide at its widest part. More than half the surface is marsh; the remainder is sparsely timbered, and of late years has been considerably occupied with vineyards. Its beaches furnish sand for building purposes.

PELEW′ ISLANDS, a group of islands in the North Pacific ocean, belonging to Spain, 450 m. e. of the Philippines, in lat. 7° to 8° n., long. 134° to 134¾° e. at the western extremity of the Caroline archipelago. The group includes 6 inhabited and a number of smaller islands (Korror, Uruktapi, Pililin, Eilmak, etc.), with a total area of 190 sq. m. The principal island is Babelthouap, area 116 sq. m., containing a mountain from whose summit a view of the whole group is obtained. As seen from the sea the islands appear mountainous and rugged; but the soil is rich and fertile, and water is abundant. Bread-fruit, cocoa-nuts, bananas, sugar-cane, lemons, oranges, and other tropical trees and fruits are grown. Cattle, fowls and goats thrive, and fish abound on the coasts. Chief exports, copra, tortoise shell, mother-of-pearl and sea-cucumbers. The climate is uniform, but hot, ranging from 77° to 91°. The inhabitants, who are estimated at about 3,000 in number, are of the Malay race. They show considerable ingenuity in building their canoes, and are active agriculturists. The islands are said to have been discovered by the Spaniards in 1545. See illus., JAVA, ETC., Vol. VIII.

PELIAS, in classical mythology son of Poseidon and of Tyro, daughter of Salmoneus. With his twin brother he was abandoned by his mother, but was found and nurtured by a herdsman, who called him P. because his face was discolored by a kick from a mare, and called his brother Neleus, because a dog had nursed him. When the brothers grew up they found their mother, who had married Cretheus, king of Iolcus in Thessaly, and on the death of the latter P. seized the throne. He despatched Jason in search of the Golden Fleece, and on the return of that hero was ignorantly put to death by his own daughters, through the instrumentality of Medea. See ARGONAUTS; MEDEA.

PELICAN, *Pelicanus*, a genus of birds of the family *Pelecanidæ* (q.v.), having a very long, large, flattened bill, the upper mandible terminated by a strong hook, which curves over the tip of the lower one; beneath the lower mandible, which is composed of two flexible bony branches meeting at the tip, a great pouch of naked skin is appended; the tongue is very short, and almost rudimentary; the face and throat are naked; the wings of moderate length, the tail rounded. The species are widely distributed, frequenting the shores of the sea, lakes, and rivers, and feeding chiefly on fish. Although birds of powerful wing, they are seldom seen at a great distance from land. All of them are birds of large size. They take their prey by hovering over the water, and plunging upon it when it appears. They often fly in large flocks, and the sudden swoop of a flock of pelicans at a shoal of fish is a striking and beautiful sight. They store up their prey in their pouch, from which they bring it out at leisure, either for their own eating, or to feed their young. The pouch is capable of being wrinkled up into small size, and of being greatly distended. The COMMON PELICAN (*P. onocrotalus*) is as large as a swan, white, slightly tinged with flesh color, and in old birds, the breast golden yellow. The quill-feathers are black, but are scarcely seen except when the wings are expanded. It is a native of the eastern parts of Europe, and of many parts of Asia and Africa, and frequents both the sea-coast and also rivers and lakes. It makes a nest of grass on the ground in some retired spot near the water, often on an island, and lays two or three white eggs. The parents are said to carry water to their young, as well as food, in their pouch. During the night, the pelican sits with its bill resting on its breast. The nail or hook which terminates the bill is red, and Mr. Broderip supposes that the ancient fable of the pelican feeding its young with blood from its own breast has originated from its habit of pressing the bill upon the breast, in order the more easily to empty the pouch, when the red tip might be mistaken for blood.—The RUFOUS-NECKED PELICAN (*P. fuscus*) abounds in the West Indies and in many parts of America.

In heraldry, the pelican is drawn with her wings indorsed, and wounding her breast with her beak. When represented in her nest feeding her young with her blood, she is called a pelican *in her piety*. See illus., BIRDS, vol. II.; LARKS, ETC., vol. VIII.

PELICAN STATE. See STATES, POPULAR NAMES OF.

PE'LION, the ancient name of a wooded mountain range in Thessaly, extending along the e. coast. Its eastern side descends in steep and rugged precipices to the sea. Further to the n., near the mouth of the Peneus, is the steep conical peak of Ossa (q.v.), which according to the classic myth, the Titans placed upon the summit of Pelion, in order to scale Olympus, the abode of the gods. The modern name is Zagorà, and, as of old, its sides and summit are clothed with venerable forests of oak, chestnut, beech, elm, and pine.

PELISSIER, AMABLE JEAN JACQUES, Marshal of France, Duc de Malakoff, b. in 1794 at Maromme, near Rouen. His father was a small farmer, little above the degree of a peasant. Pelissier was first sent to the lyceum at Brussels. At twenty he gained admission to the celebrated French artillery college of La Flèche, and was soon transferred to the special school of St. Cyr. He entered the artillery of the royal guard as sub-lieut. in 1814, and being transferred to the 57th regiment of the line, which was not called upon to do duty after the return of Napoleon from Elba, he escaped the dilemma of declaring either for or against the emperor. He served on the staff in Spain in 1823; made the campaign of the Morea in 1828; joined the first expedition to Algiers in 1830 as maj. of cavalry; and in 1839 returned to Algeria with the rank of lieut.-col. He commanded the left wing of the French army at the battle of Isly. In 1845 he acquired an unenviable notoriety by suffocating more than 500 Arabs who took refuge in the caves of Ouled-Riah in the Dahra. Marshal Soult, then minister of war, did not venture to approve this atrocity, but Marshal Bugeaud, commander-in-chief in Algeria, declared that Pelissier only carried out his positive orders. By 1850 he had attained the rank of gen. of division. When the news of the *coup d'état* reached Algiers, he espoused the cause of the emperor, and placed the province of Algiers under martial law until order was restored. In the war with Russia, he obtained in 1855 the command of the first corps of the Crimean army, and soon succeeded Marshal Canrobert in the chief command, when a change came over the fortunes of the campaign. The Russians were defeated on the Tchernaya, and on Sept. 8th, the Malakoff, the key of Sebastopol, was carried. After the fall of Sebastopol, Pelissier received a marshal's baton, and on his return to France, was created duc de Malakoff and a senator, and received a dotation of 100,000 francs. He also received the order of G.C.B. from Queen Victoria. In 1858 he came to London as the French ambassador, but resigned his post, for which he had little relish, in the following year. He was then named gov.gen. of Algiers, where he died (May, 1864) of congestion of the lungs.

PEL'LA, the ancient capital of Macedonia, and the birthplace of Philip II. and of Alexander the Great, was situated on a hill, and surrounded by marshes. It was a wealthy and powerful city, but declined under the Romans until it became a place of no consequence, and in the middle ages there remained only a strong castle called *Bodena*. Its site, 24 m. w.n.w. of Salonica, is near the modern Ala-Kilisa.

PEL'LAGRA, at one time, the name of a loathsome skin disease, supposed to be endemic to the rice-producing part of the north of Italy, is now employed to designate a group of phenomena, of which the most prominent and significant are mental. Allied affections have recently been described in various continental countries; but as presented in its most intense form in Lombardy, pellagra consists in the skin being covered with tubercles and rough scales, in debility, vertigo, inability to preserve the equilibrium, epilepsy, and great depression of spirits. The melancholia which constituted the latter stage often led to suicide, and so frequently to destruction by drowning that it was distinguished as a special form of the tendency by the appellation of hydromania. The extent of the ravages of this affection may be estimated from the facts that of 500 patients in the Milan lunatic asylum in 1827, one-third were pellagrins; that when Strambio wrote (1784), one of every twenty, and when Holland (1817), one of every five or six of the population presented symptoms of the disease. The belief, so long current, that this malady was the result of the use of rice or maize as the chief article of diet, must now be greatly modified, as it has been observed in districts and under circumstances where the food is of a different description; but where poverty, insufficient nourishment, filth, toil, and the ordinary agents in human degeneration are at work.

PELLET, or Ogress, in English heraldry, a roundle sable. See Heraldry.

PELLICANUS, Conrad, 1478–1554; b. Ruffach, Alsace; d. Zurich, Switz. His paternal name was Kürsner; the name of Pellicanus was given him by his uncle, an ecclesiastic, who sent him to the univ. of Heidelberg, 1491–92. In his 16th year he determined to become a friar, and was sent to the Minorite convent at Tübingen, 1496, where he began the study of Hebrew. He was a useful helper to Reuchlin, and published the first Hebrew grammar in a European tongue, 1503. He was ordained priest, 1501, and served his order until 1526, when he threw aside his cowl, having gradually adopted Protestant views, and became prof. of Hebrew at Zurich (1527), whence he was called by Zwingli. He was twice married, and remained at Zurich until his death. His linguistic scholarship was rare for his time. His chief work was a biblical commentary in 7 vols., Zurich, 1532–39. His Latin autobiography is one of the most interesting documents of the Reformation period.

PEL'LICO, Silvio, an Italian poet, celebrated for his long and cruel imprisonment by the Austrians, more, perhaps, than for his verses, was b. in 1789 at Saluzzo, in Piedmont, and was educated in Pignerol, where his father, Onorato Pellico, also favorably known as a lyric poet, had a silk-factory. In his 16th year he accompanied his sister Rosina (on her marriage) to Lyons, where he remained until Foscolo's *Carme de' Sepolcri* awakened in him a strong patriotic feeling and an irresistible desire to return to Italy. Coming, about 1810, to Milan, where his family were now settled, he was warmly received by Ugo Foscolo and Vincenzo Monti, and was employed as tutor in the family of count Porro, in whose house all the most distinguished men in Milan were accustomed to meet. His tragedies of *Laodamia* and *Francesca da Rimini* gained him an honorable name amongst Italian poets. He also translated the *Manfred* of Byron, with whom he had become acquainted. He lived in great intimacy with the most eminent patriots and authors of liberal views, and took an active part in a periodical called *Il Conciliatore*, which, after a time, was suppressed, on account of its liberal tone. Having become connected with the secret society of the Carbonari, then the dread of the Italian government, Pellico was apprehended in 1820, and sent to the prison of Sta. Margherita, where his friend, the poet Maroncelli, was also confined. In the beginning of the following year he was carried to Venice, and in Jan., 1822, to the prison on the isle of San Michele, near Venice; and Maroncelli and he were at last condemned to death; but the emperor commuted the sentence to 20 years' imprisonment for Maroncelli, and 15 years for Pellico. In Mar., 1822, they were both conveyed to the subterranean dungeons of the Spielberg. In Aug., 1830, however, they were set at liberty. Pellico published an account of his sufferings during his ten years' imprisonment, under the title *Le mie Prigioni* (Paris, 1833), which has been translated into other languages, and has made his name familiar where it would not have been known on account of his poetry. Pellico's health, never robust, was permanently injured. The marchioness of Barolo received him into her house at Turin as her secretary. Pellico subsequently published numerous tragedies and other poems, and a little catechism on the duties of man. His death took place Jan. 31, 1854.

PELLITORY, or Pellitory of the Wall, *Parietaria*, a genus of plants of the natural order *urticeæ*, having both unisexual and hermaphrodite flowers on the same plant, the perianth of both kinds 4-fid.

PELLITORY OF SPAIN, *Anacyclus pyrethrum*, a plant of the natural order *compositæ*, of a genus nearly allied to chamomile (q.v.), a native of the Levant and of Barbary, and cultivated to some extent in Germany and other countries. It has procumbent, branched,

downy stems; each branch one-flowered; the root-leaves pinnate, with pinnatifid segments and linear-subulate lobes. The flowers (heads of flowers) have a white ray, purplish beneath, and a yellow disk. The root is spindle-shaped and fleshy, and when dried is about the thickness of the little finger, inodorous, breaking with a resinous fracture. It has a very peculiar taste, slight at first, but becoming acidulous, saline, and acrid, with a burning and tingling sensation in the mouth and throat, which continues for some time. It is valued in medicine, and is chewed or administered in the form of a tincture to relieve toothache, also in cases of paralysis of the tongue.

PELOP'IDAS, a celebrated Theban general, of noble descent, noted among his fellow-citizens for his disinterested patriotism. The inviolable friendship between himself—one of the richest men in Thebes—and Epaminondas—one of the poorest—is among the most beautiful things recorded in Greek history. In 382 B.C. he was driven from Thebes by the oligarchic party, who were supported by the Spartans, and forced to seek refuge at Athens, whence he returned secretly with a few associates, 379 B.C., and recovered possession of the Kadmeia, or citadel, slaying the Spartan leader, Leontiades, with his own hand. Plutarch gives us a vivid picture of the adventurous exiles gliding quietly, in disguise, into the city, on a winter afternoon, amid bitter wind and sleet. Having been elected Bœotarch, in conjunction with Melon and Charon, he set about training and disciplining his troops, so that they soon became as formidable as the Lacedæmonians, and were successful in several small encounters with the latter. His "sacred band" of Theban youth largely contributed to the victory of Epaminondas at Leuctra (371 B.C.), but failed in a subsequent attack on Sparta itself. In the expedition of the Thebans against the cruel tyrant Alexander of Pheræ (368 B.C.), he was, after several important successes, treacherously taken prisoner, when in the character of an ambassador; but was rescued by Epaminondas in the expedition of the following year. He was then sent to Susa, as ambassador from Thebes, to counteract the Spartan and Athenian intrigues going on at the court of Persia, and behaved himself very nobly while there. His diplomacy was successful. In 364 B.C. a third expedition was planned against Alexander of Pheræ, who, as usual, was threatening the Thessalian towns. The command was given to Pelopidas, and in the summer he marched into Thessaly, where he won the battle of Kynoskephalæ, but was himself killed while too eagerly pursuing the foe. He was buried by the Thessalians with great pomp.

PELOPONNE'SIAN WAR. See GREECE.

PELOPONNE'SUS (i.e., the isle of Pelops), now called the Morea (q.v.), a peninsula, which formed the southern part of ancient Greece, Hellas proper being situated to the northward of the isthmus, on which stood the city of Corinth. See GREECE. The whole area is less than 9,000 sq. miles. In the most flourishing periods of Grecian history, the Peloponnesus had a population of more than two millions, although at present it has little over half a million. Among its most important cities were Sparta in Laconia, and Argos the capital of Argolis. Sparta acquired, after the Messenian war, a decided supremacy over the other states, and disputed the supremacy with Athens in a war of almost thirty years' duration (431–404 B.C.)—the famous "Peloponnesian war," of which the history has been written by Thucydides. After the Roman conquest, the Peloponnesus formed part of the province of Achaia, and subsequently belonged to the Byzantine empire. For its later history, see MOREA.

PE'LOPS, in Greek mythology, the grandson of Zeus, and the son of Tantalus, was slain by his father, and served up at an entertainment which he gave to the gods, in order to test their omniscience. They were not deceived, and would not touch the horrible food; but Ceres, being absorbed with grief for the loss of her daughter, ate part of a shoulder without observing. The gods then commanded the members to be thrown into a caldron, out of which Clotho brought the boy again alive, and the want of the shoulder was supplied by an ivory one. According to the legend most general in later times, Pelops was a Phrygian, who, being driven by Ilos from Sipylos, came with great treasures to the peninsula, which derived from him the name of Peloponnesus, married Hippodamia, obtained her father's kingdom by conquering him in a chariot-race, and became the father of Atreus, Thyestes, and other sons. But, in what appear to be the oldest traditions, he is represented as a Greek, and not as a foreigner. He was said to have revived the Olympic games, and was particularly honored at Olympia.

PELOUZE, THÉOPHILE JULES, 1807–67; b. France; completed his chemical studies under Guy Lussac, became professor of chemistry in 1830, and in 1831 associate lecturer with Lussac on chemistry in Paris at the polytechnic school, and in 1833 assayer at the mint. In 1836 he joined Liebig in Germany, and was associated with him in the discovery of œnanthic ether. On his return to Paris he was professor at the polytechnic school; in 1851 was called to fill a chair at the college of France. He is credited with the discovery of a new class of salts, the nitro-sulphates; a new and improved mode of forming copper-plate; the discovery of green cyanuret of iron; new means for simplifying the manufacture of glass; the discovery of the law of pyrogenous acids; a process for the fabrication of tannin; exhaustive analyses of the composition of beet sugar; the mode of producing fat from glycerine and an acid; the discovery of the preparation of gun-cotton; and numerous other useful discoveries.

PELTIER, JEAN CHARLES ATHANASE, 1785–1845; b. Ham, France; d. Paris. He was a watchmaker, but gave up his trade abt. 1815, to apply himself to experimental and

observational science. He made a great discovery concerning the thermal effects at junctions in a voltaic circuit, 1834, finding that the junctions in a heterogeneous circuit of metals could be heated or cooled according to the direction in which an electric current is made to pass round the circuit. He published numerous scientific papers.

PELTRY, a general term applied to the trade in skins of wild animals, and to the skins themselves. It is understood to mean only skins undressed, except by drying, and chiefly those which, when dressed, are called furs, and it is especially applied to the produce of the north-western territory (Hudson's Bay territory) of British North America, although all others are included. See FUR AND FURRIERY.

PELU'SIUM, the Greek name of an ancient Egyptian city, situated at the north-eastern angle of the Delta, and important as the key of Egypt on the Asiatic side. The eastern mouth of the Nile derived from it the epithet pelusian (*ostium pelusiacum*). Pelusium is called *sin* in the Old Testament; and both words, as well as the native Coptic or Egyptian name *peremoun*, or *peromi*, signify the mud-city. The *ostium pelusiacum* was choked up with sand as long ago as the 1st c. B.C., and its distance from the sea has ever since been increasing. Pelusium appears to have originally borne the name of Anaris, or Abaris. It is so called by Manetho, who attributes its foundation to the Hyksos about 2,000 B.C.; but it first figures in semi-authentic history as the scene of Sennacherib's defeat, when (according to the Egyptian tradition, as reported by Herodotus), the camp of the Assyrians was invaded at night by a host of field-mice, who gnawed their bow-strings and shield-straps, so that in the morning, when the Egyptians fell upon them, they were defenseless. For the Hebrew account of Sennacherib's defeat see 2 Kings, chaps. 18 and 19. In 525 B.C., Cambyses overthrew, near Pelusium, the forces of Pharaoh-Psammetichus. The city was also taken by the Persians in 309 B.C.; and in 173 B.C. it was the scene of the defeat of Ptolemy Philometor by Antiochus Epiphanes. Mark Antony captured it, 55 B.C., and it opened its gates to Octavian after his victory at Actium, 31 B.C. Its later history is unimportant.

PELVIS, THE (from the Latin *pelvis*, a basin), is a bony ring interposed between the spinal column and the lower extremities, so as to transmit the weight of the former to the latter. Before considering the pelvis as a whole, it will be expedient to consider the individual bones of which it is composed. These, in the adult, are four in number, viz., the two ossa innominata which constitute its sides and front, and the sacrum and coccyx, which complete it behind. The *os innominatum* receives its name from its bearing no resemblance to any known body, and is a large irregular-shaped bone. In the young subject, it consists of three separate bones, which meet and form the deep, cup-shaped cavity (the *acetabulum*), situated a little below the middle of the outside of the bone, and in which the head of the thigh-bone rests. Hence it is usual to describe this bone as consisting of the ilium, the ischium, and the pubes. The *ilium* is the superior, broad, and expanded portion which forms the prominence of the hip, and articulates with the sacrum. This bone may be described as divisible into an external and an internal surface, a crest, and an anterior and posterior border. The external surface (see Fig. I.) is convex in front, and concave behind; it is bounded above by the crest, below by the upper border of the acetabulum (see Fig. II.), and in front and behind by the anterior and posterior borders. It presents various curved lines and rough surfaces for the attachment of the *glutæi* and other powerful muscles connecting the pelvis and the lower extremities. The internal surface, which is smooth and concave, has the same boundaries as the external, except inferiorly, where it terminates in a prominent line, termed the *linea ilio-pectinea*. The surface of the crest is convex, roughened, and sufficiently broad to admit of the attachment of three planes of muscles. The borders will be sufficiently understood by a reference to fig. I. The *ischium* is the inferior and strongest portion of the bone. It consists of a thick and solid portion, the *body* (whose inferior border is termed the *tuberosity*), and a thin ascending portion, the *ramus*. In the ordinary sitting position, the whole weight of the body rests on the ischium; and by sitting on the hands, we can usually feel the part (the *tuberosity*, see Fig. I. 15) through which the weight is transmitted. The *pubes* is that portion which runs horizontally inward from

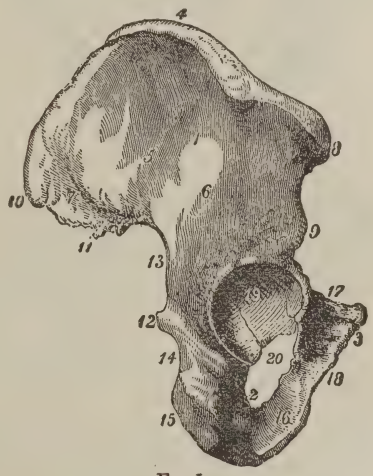


FIG. I.

The os innominatum of the right side.
1, the ilium, its external surface; 2, the ischium; 3, the os pubis; 4, the crest of the ilium, 5, 6, upper and lower curved lines for attachment of muscles; 7, the surface for attachment of the glutæus maximus; 8, 9, the anterior superior and inferior spinous processes; 10, 11, the posterior spinous processes; 12, the spine of the ischium; 13, 14, the greater and lesser sacro-ischiatic notches: 15, the tuberosity of the ischium; 16, its ramus: 17, the body of the os pubis; 18, its ramus; 19, the acetabulum; 20, the thyroid or obturator foramen.—(From Wilson.)

the inner side of the acetabulum for about 2 in., and then descends obliquely outward for about the same length, thus making an acute angle with its original direction. The former part is called the *body*, and the latter the *ramus*, of the pubes. The ramus is continuous with the ramus of the ischium. Between the ischium and the pubes is a large aperture, known as the *thyroid* or *obturator foramen*, which in the living body is closed by a membrane termed the *obturator ligament*. The object of this large foramen is probably to give lightness to the parts, without materially diminishing their strength.

The development of the os innominatum affords an excellent example of the general principles laid down in the article OSSIFICATION. There are no less than *eight* centers of ossification for this bone: three primary—one for the ilium, one for the ischium, and one for the pubes—and five secondary ones for various processes, etc. The first center appears in the lower part of the ilium, at about the same period that the development of the vertebræ commences, viz., at about the close of the second month of fœtal life; the second in the body of the ischium, just below the acetabulum, at about the third month, and the third in the body of the pubes, near the acetabulum, during the fourth or fifth month. At birth the crest of the ilium, the bottom of the acetabulum, and the rami of the ischium and pubes, are still cartilaginous. At about the sixth or seventh year, these rami become completely ossified; next, the ilium is united to the ischium; and lastly, the pubes is joined to the other two in the acetabulum. The complete ossification of the bone, from the secondary centers in the crest of the ilium, the tuberosity of the ischium, etc., is not completed till about the 25th year.

Each os innominatum articulates with its fellow of the opposite side (through the intervention of the *interosseous fibro-cartilage*, which unites the two surfaces of the pubic bones, see Fig. II. *f*), with the sacrum, and with the femur (at the acetabulum). No less than 35 muscles are attached to this bone, some proceeding to the region of the back, others forming the walls of the abdomen, others forming the floor of the pelvis, others passing downward to the lower extremities, etc. As the other bones entering into the formation of the pelvis, the sacrum, and the coccyx, belong essentially to the vertebral column, and will be described in the article on that subject, it is sufficient here to remark that, collectively, they form a triangular bony mass (with the base upward, and with a concave anterior surface), which constitutes the posterior part of the pelvic ring. See Fig. II. 4, 5.

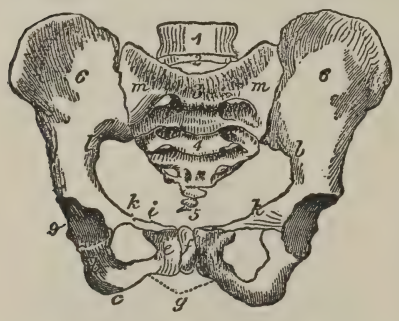


FIG. II.

Pelvis (with fifth lumbar vertebra) of European female adult. Transverse diameter, 5.7; antero-posterior diameter, 4.5 inches.
1, the last lumbar vertebra; 2, the inter-vertebral substance connecting it with the sacrum; 3, the promontory of the sacrum; 4, its anterior surface; 5, the coccyx; 6, 6, the iliac fossæ; 9, the acetabulum; *c*, the tuberosity, and *b* the body of the ischium; *e*, the os pubis; *f*, the symphysis pubis; *g*, the arch, *i*, the spine, and *k* the pectineal line of the pubis; *k*, *l*, *k*, *l*, the ileo-pectineal lines.—(From Humphry.)

The pelvis, considered as a whole, is divisible into a false and true pelvis. The *false pelvis* is all that expanded portion which is bounded laterally by the iliac bones, and lies above the prominent line termed the *linea ileo-pectinea* (see Fig. II. *k*, *l*); while the *true pelvis* is all that part of the general pelvic cavity which is situated below that linc. The broad, shallow cavity of the false pelvis serves to support the weight of the intestines; while the rectum, bladder, and part of the generative organs, lie in the cavity of the true pelvis. The upper aperture of the true pelvis is termed the *inlet*. It is somewhat heart-shaped in form, and has three principal diameters—an *antero-posterior* (or sacro-pubic), which extends from the angle formed by the sacrum with the last lumbar vertebra to the symphysis pubis, or point of union of the two pubic bones; the *transverse*, at right angles to the former, and extending across the greatest width of the pelvis; and the *oblique*, extending from the sacro-iliac symphysis (or union), on one side, to the margin of the brim corresponding with the acetabulum on the other. The diameters of the outlet are two—an *antero-posterior*, extending from the tip of the coccyx to the lower part of the symphysis pubis; and a *transverse*, from the posterior part of one ischiatic tuberosity, to the same point on the opposite side. As the precise knowledge of the diameter and depth of the pelvis is of the greatest importance in the practice of midwifery, we give the average numbers representing the dimensions of a well-formed adult female pelvis. *Diameters of inlet or brim*—antero-posterior, 4.4 in.; transverse, 5.4 in.; oblique, 4.8 inches. *Diameters of outlet*—antero-posterior, 5 in.; transverse, 4.3 inches. *Depth of the true pelvis*—posteriorly, 4.5 in.; in the middle, 3.5 in.; anteriorly, 1.5 inches.

The pelvis is placed obliquely with regard to the trunk of the body; the plane of the inlet to the true pelvis forming an angle of from 60° to 65° with the horizon. According to Naegele (*Ueber das weibliche Becken*), the extremity of the coccyx is in the female, when standing upright, about 7 lines higher than the lower edge of the symphysis pubis; the upper edge of the symphysis being at the same level as the lower edge of the second

segment of the coccyx. By attention to these data, a detached pelvis may readily be placed at the angle at which it normally lies in the skeleton. The shape of the human pelvis is much affected by the curving forward of the lower part of the sacrum. This bend of the sacrum forward serves to support the viscera, when the body is in an erect posture; but it is of much more importance in its relation to the act of parturition. If all the antero-posterior diameters of the true pelvis from the brim to the outlet were bisected, the points of bisection would form a curved line, similar to the curve of the sacrum, and termed the *axis* of the pelvis. As the head of the child has to follow this curve, the difficulties of parturition are much greater than if the axis of the pelvis had been straight, as in the other vertebrata. Without entering into unnecessary details, we may remark generally, that the fœtal head is of oval shape, with its greatest diameter from before backward, and that in its passage through the pelvis it is so placed that its longest diameter at each stage of labor coincides with the longest diameter of the pelvis. The head enters the pelvis with the occiput (or back of the skull) being directed toward one ilium, and the face toward the other, while, at its final emergence, the face is turned toward the sacrum and coccyx. There can be no doubt that the screw-like or rotatory motion which is thus given to the fetal head, renders its passage through the the pelvis more easy than it would otherwise have been.

There are well-marked differences, chiefly having reference to the act of parturition, between the male and female pelvis. In the female, the bones are lighter and more delicate than in the male, and the muscular impressions and eminences are less distinctly marked. The iliac fossæ are large and expanded, and hence the great prominence of the hips. The several diameters (particularly the transverse diameter of the brim, which measures only 5.1 in. in the male) are somewhat greater; and the pubic arch is wider by about 10 degrees; the sacrum also is wider and less curved.

It is worthy of notice that the pelvis of the negro is smaller in all its dimensions than that of the European, and presents a partial approximation to that of the monkey, especially in the deficiency of its width. This difference is very much more obvious in the male than in the female negro; and parturition in the black races is facilitated both by the sacrum being less curved, and by the fœtal head being of smaller dimensions. In the apes and monkeys, which approach most nearly to man, the pelvis is longer and narrower, and much less curved than in the human subject. In other mammals, the differences are for the most part the same in kind, but greater in degree. In many of the cheiroptera (bats) and insectivora (as the mole), the pubic bones are only loosely connected by a small ligament, or there is a complete opening between the bones (as occurs normally in birds), an arrangement by which the act of parturition in these animals is much facilitated. The pelvic bones are very simple in the cetacea, in some cases being represented by two simple elongated bones lying near the anus, and converging from opposite sides (a transverse connecting piece being sometimes but not always present); in others, by a small V-shaped bone, while sometimes (as in manatus) they seem to be entirely wanting. The additional pelvic bones in the non-placental mammals have been already noticed in the articles on the MARSUPIALIA and MONOTREMATA. In the echidna (belonging to the latter order), the acetabulum is perforated, as occurs normally in birds. In birds, in addition to the peculiarity just noticed, we find the pelvis open in front (or, more correctly, inferiorly), there being no union of the pubic bones in any bird except the ostrich. This normal incompleteness of the pelvic ring is obviously for the purpose of facilitating the passage of the eggs. It is unnecessary to trace the further degradation of the pelvic bones in the reptiles and fishes.

PEMBA, called the green isle by the Arabs, an island off the e. coast of Africa, in the British protectorate of Zanzibar, the nearest point being about 20 m. from the coast, and the southmost point 30 m. n. of the island of Zanzibar. Lat. of eastern P., 4° 54′ s., long. 39° 53′ e. Length, 35 m. from n. to s.; area, 227 sq. m. Pop. about 40,000. Next to Zanzibar, Pemba is the most remarkable island in the dominions of the sultan. It is an irregular coralline island, cut up in every direction by creeks which were formerly much frequented by country craft engaged in the slave-trade; while, owing to the numerous reefs and shoals, and to the imperfect survey of the island, they are quite impracticable for vessels of war. The vegetation is most luxuriant. Although the main island is less cultivated than Zanzibar, it appears more productive, producing good timber and plentiful supplies for shipping, especially rice, maize, sorghum, and sugar cane, but since the abolition of slavery agriculture has languished. Pemba is more unhealthy than Zanzibar, and the mortality from fever is great. Chak-Chak, the chief fort, port, and town, is situated in a deep inlet on the western side, and the narrowest part of the island. Its approach is winding and difficult. The Portuguese long made Pemba one of their principal slave depots, but this traffic has ceased since Nov., 1890, when the island came under British protection.

PEMBERTON, JOHN CLIFFORD, b. Penn., 1814; educated at West Point, and received the commission of lieut. in the artillery, 1837; served in the Seminole and Mexican wars, and for his gallantry at Monterey and Molino del Rey was brevetted capt. and major. In 1861 he resigned and joined the confederate army as a cavalry col. attached to Gen. Joseph Johnston's staff. In 1863, as lieut.-gen., he had command of the department of the Mississippi, and had charge of the defense of Vicksburg, which he surrendered on July 4, 1863. After the war he was engaged in farming in Virginia. He d. 1881.

PEM'BINA, a co. in n.e. N. Dakota, formed in 1873, bounded on the e. by the Red river of the North; drained by the Pembina river; 1120 sq. m.; pop. 1890, 14,334, chiefly of American birth. The surface is rolling, and the soil fertile. The principal productions are wheat, corn, barley, and cattle. Co. seat, Pembina.

PEM'BINA, a former co. in n.w. Minnesota, bounded on the n. by British America, on the n.e. by the Lake of the Woods, on the w. by the Red River of the North, watered by affluents of the Red and Rainy Lake rivers; about 7,000 sq. m.; pop. '80, 905. The valley of the Red river is fertile. The name was changed in 1878 to Kittston.

PEMBROKE, a seaport of south Wales, a market t., parish, and municipal and parliamentary borough, in the county of the same name, occupies a rocky ridge on a navigable creek of Milford Haven, 42 m. w. of Swansea. On the extremity of the ridge on which the town is built are the remains of its once extensive castle, said to have been the birthplace of Henry VII. Beneath the ruins is a remarkable natural cavern, which had communications both with the castle and the harbor. In 1648 the castle was beleaguered by Cromwell, and taken after a siege of six weeks. The keep, the principal building in the inner court, is 75 ft. high, and 163 ft. in circumference, and is surmounted by a cone-shaped roof of masonry, still perfect. *Pater*, otherwise called Pembroke dock, which is rather a shipbuilding than a commercial center, is 2 m. from the town, and has several building-slips and a dry dock. The naval establishment of the government embraces an area of 80 acres, and is surrounded by a high wall. Pop. mun. bor., '91, 14,978.

PEMBROKE, town and co. seat of Renfrew co., Ont., Canada; on the Ottawa river, 86 miles from Ottawa; has a large business in lumber and various manufactures. Pop. '91, 4,401.

PEMBROKE, Earl of. See Herbert.

PEMBROKE COLLEGE, Oxford. Broadgates Hall, a place of education, originally belonging in part to St. Frydeswyde's priory, and in part to the monastery of Abingdon, was, on the dissolution of the religious houses, given to Christ church by Henry VIII. In 1629 it was made a college by James I., and took its name from the earl of Pembroke, then chancellor of the university. By the ordinances of the commissioners under 17 and 18 Vict. c. 81, the constitution of the college is now as follows: There are to be not less than 10 fellowships, open to all, not to exceed £200 a year in value, so long as the number of the fellowships is less than 16. There are not to be less than 12 incorporated scholarships. There are at present 24 which are tenable for 5 years—except the Townshend scholarships, tenable for 8 years—the holders, however, sharing in the emoluments during only 4 years. This college presents to 8 benefices, of which 6 have been purchased since 1812.

PEMBROKE COLLEGE, Cambridge, was founded in 1347 by Mary de St. Paul, the widow of Aymer de Valence, earl of Pembroke. She was maid, wife, and widow, all in one day, her husband being slain at a tilting-match held in honor of her nuptials. On this sad event, she sequestered herself from all worldly delights, and bequeathed her estate to pious uses. Henry VI. was so liberal a benefactor to this college as to obtain the name of a second founder. There are 13 fellowships and 23 scholarships of different values.

PEMBROKESHIRE, a maritime co. of south Wales, and the westernmost co. of the principality, is bounded s. by the Bristol channel, and w. and n. by St. George's channel. Area, according to the census of '91, 614 sq. m. Pop. '91, 88,296. The river Teivy separates the county on the n.e. from that of Cardigan. On the n. are Newport and Fishguard bays, the latter 3 m. in width, from 30 to 70 ft. in depth, and with good anchoring-ground. St. Bride's bay, the widest inlet on the western coast, is 10 m. in width, and has an inland sweep of 7 miles. Milford Haven (q.v.) is the most important estuary. The shores on the s. are wild and inhospitable, and fronted by high precipitous cliffs. The surface is undulating; green hills alternate with fertile valleys. The principal elevations occur in the Precelly hills, which traverse the n. of the county from e. to w., and rise in their highest summit to the height of 1754 feet. The rivers of the greatest importance are the Eastern and Western Cleddau, which unite and form a navigable portion of Milford Haven. None of the rivers, of which the Western Cleddau is the principal, are important. The climate is mild, but damp in the s. of the county; while in the n., the temperature is considerably lower. There are excellent and productive soils in the s., and along the n.w. coast the barley districts are famous; but the land on the Precelly mountains and in the coal districts is inferior. Coal, slate, lead, and iron, are the only minerals worked. Oats, barley, and potatoes are the principal crops. Pembrokeshire is chiefly remarkable from the fact that, although the most distant of Welsh counties from England, more than half its surface is inhabited by an English-speaking population. This arose from the settlement of a colony of Flemings here, and their adoption of the English tongue. The district has hence been called Little England beyond Wales. Pembrokeshire returns one member to parliament. The chief towns are Haverfordwest, St. Davids, Pembroke, and Tenby.

PEM'ISCOT, a co. in s.e. Missouri, adjoining Arkansas, bounded on the e. by the Mississippi river; 480 sq.m.; pop. '90, 5975. The surface is even, with many swamps and forests. The principal productions are corn and pork. Co. seat, Gayoso.

PEMMICAN. This was originally a North American Indian preparation only, but it was introduced into the British navy victualing-yards, in order to supply the arctic expeditions with an easily preserved food, containing the largest amount of nutriment in the smallest space. As made by the Indians, it consists of the lean portions of venison dried by the sun or wind, and then pounded into a paste, and tightly pressed into cakes; sometimes a few fruits of *amelanchier ovata* are added, to improve the flavor. It will keep for a very long time uninjured. That made for the arctic voyagers was chiefly of beef. In making pemmican, it is necessary to remove the fat completely.

PEMPHIGUS, or Pom'pholyx, belongs to that order of skin-diseases which is characterized by an eruption of large vesicles, filled with serous fluid, and known as *bullæ*. The disease occurs both in the acute and in the chronic form. In a mild case of acute pemphigus, bullæ, or blisters, from the size of a pea to that of a chestnut appear in succession (chiefly on the extremities), and having continued three or four days, break, form a thin scab, and soon heal, unaccompanied with febrile or inflammatory symptoms. In severe cases, there is considerable constitutional disturbance; the bullæ are larger, and the scabs heal with difficulty. The chronic form differs mainly from the acute by its prolonged continuance. The acute variety chiefly affects children, and has been ascribed to dentition, errors of diet, etc.; while the chronic form chiefly attacks aged persons, and is probably due to debility and impaired nutrition. The acute form usually requires nothing but cooling medicines and diet, and mild local dressings, such as simple cerate, to protect the raw surfaces from exposure to the air. In the chronic form, a nutritious diet, with the judicious use of tonics (iron, bark, etc.), is most commonly successful. In obstinate cases, arsenic is sometimes of use.

PEN, an instrument for writing with a fluid. In ancient times, a kind of reed (Lat. *calamus*) was chiefly used, though sometimes the letters were painted with a fine hair-pencil, as among the Chinese at the present day. Quill pens (see Quills) probably came into use after the introduction of modern paper. The English name pen is from Lat. *penna*, a feather; but the old form of *penna* was *pesna* or *petna* (= Gr. *peteron*), from the root *pet*, to fly; and just as Lat. *ped* is identical with Eng. *foot* (see letter F), so *petna* or *peteron* corresponds to *feather* (Ger. *feder*). During last century, many efforts were made to improve the quill pen, the great defect of which was its speedy injury from use, and the consequent trouble of frequent mending; moreover, even the most skillful maker could not insure uniformity of quality, and any variation affected the writer's work. These efforts were chiefly directed to fitting small metal or even ruby points to the nib of the quill-pen; but the delicacy of fitting was so great that but very little success attended the experiments. At the beginning of this century pens began to be made wholly of metal; they consisted of a barrel of very thin steel, and were cut and slit so as to resemble the quill pen as closely as possible. They were, however, very indifferent, and being dear (the retail price at first was half-a-crown, and subsequently sixpence), they made but little way; their chief fault was hardness, which produced a disagreeable scratching of the paper. In 1820, Mr. Joseph Gillott, who dealt in the metal pens then made, hit upon an improvement, which, by removing this great defect, gave a stimulus to the manufacture, which has caused it to be developed to an extent truly marvelous. This consisted in making three slits instead of the single one formerly used, and by this means much greater softness and flexibility were acquired. Mr. Gillott also introduced machinery for the purpose of carrying out his improvements, and thereby so reduced the cost of production that he was enabled to sell his improved pens in 1821 at $36.00 per gross, which was then considered a remarkable success. Better pens are now sold at twopence per gross by the same manufacturer; or, in other words, 864 pens for the same price as one pen in 1821. Nor is this to be wondered at, when we are acquainted with the wonderful ingenuity of the machinery by which it is effected. The lowest-priced pens are made almost entirely by machinery, but the better ones require much hand labor for their completion; nevertheless, in the works of Mr. Gillott alone, who is only one of several large manufacturers in Birmingham, the annual production is now nearly 150,000,000 pens, requiring a supply of five tons per week of the fine sheet-steel made for the purpose in Sheffield, a portion of which is returned as scrap or waste for re-manufacture. From Sheffield the steel is sent in sheets about 8 ft. long by 3 ft. broad; it is prepared from the best iron, generally Swedish *bloom*. The manufacturer then prepares it by dipping for a short time in dilute sulphuric acid, which removes the *scale* or black surface; the acid itself is also carefully removed by immersion in clean water; the sheets are then passed backwards and forwards through a rolling-mill with smooth rollers, which reduces the steel to the exact thickness required, and gives it greater compactness; it is next slit into strips of various widths according to the kind of pen to be made; for the ordinary kind its width is seen in fig. 1. This is then passed through a cutting-machine, which

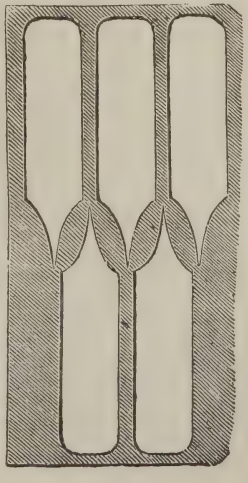
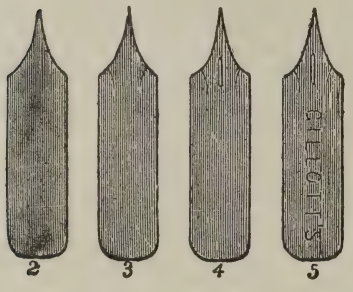


Fig 1.

rapidly punches out pieces of the shape shown in fig. 2, and in the order shown in fig. 1, which is a portion of the strip with the pieces or blanks, as they are called, cut out; that which is represented is the waste or scrap previously referred to. The blanks are now passed through a succession of operations, each conducted by a separate person: women or girls are chiefly employed. The first process is called *slitting;* they are passed one by one into a cutting-machine worked by a small hand-lever, which makes the two side-slits, as seen in fig. 3. The second process, called *piercing,* is performed by a similar machine or hand-press, in which, however, only one punch acts, and that cuts out the small hole seen in fig. 4. The repeated rolling and stamping of the metal has by this time made it hard and brittle, and it is necessary to anneal it, for which purpose some thousands of the *slit* and *pierced* blanks are put into an iron box, and placed in the fire for a time, which softens them considerably; this is the third process. When cold, another operator receives them, and with another hand-press and a punch stamps or marks, as it is called, the name of the maker, fig. 5, which constitutes the fourth process. The fifth is somewhat similar, and is sometimes omitted; it consists in placing it under another press,



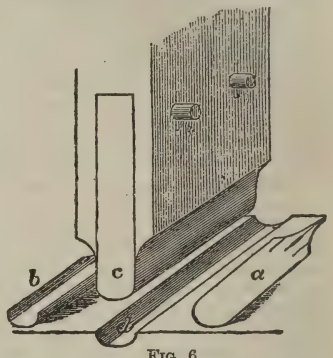


Fig. 6.

which has a punch and die for embossing any ornamental mark. The sixth process, called *raising,* consists in passing it into another press, which has a sinker and grooved die, as in fig. 6. The flat blank *a* is pushed under the sinker *c*, is pressed by the action of the lever into the groove *d*, and comes out with its edges curved up, as in *b*. The seventh process consists in *hardening,* which is done by placing the pens in an iron box or *muffle,* and when they are at a red heat, throwing them into oil; this renders them exceedingly brittle and hard, too much so, indeed, for they have now to pass through the eighth or *tempering* process, which brings them to the required temper or hardness and elasticity. The ninth operation is scouring; this consists in putting a large number into a tin cylinder, which is kept revolving by machinery; sand, and coarse emery-powder are mixed with them; and the friction of these materials and of the pens themselves cleanses them from all impurities, and brings out the natural color of the metal. The tenth and eleventh processes consist in grinding the outside of the nib, first lengthwise, and then crosswise, which are done by different persons at separate grinding-wheels. Next follows the most important operation, constituting the twelfth process or *slitting*—that is, making the central slit, upon the nicety of which the whole value of the pen depends. This is done in a hand-press similar to the others, but the cutting part consists of two chisels, one fixed on the table, the other coming down upon the depression of the lever, and so accurately adjusted as to just clear each other. The operator then skillfully holds the pen lengthwise on the fixed chisel, and brings down the moveable one, so as to effect the beautifully clean cut which constitutes so important a feature in the manufacture. Two other processes, the thirteenth and fourteenth, finish the series: the first is coloring, by heating them in a revolving cylinder over a charcoal stove, which gives them a blue or yellowish color, according to the time employed; and the last is varnishing them with a varnish composed of lac and naphtha. In the works of Messrs. Gillott, from inspection of which we have gathered these facts, there are 400 women and 100 men employed, and the daily produce is enormous: a clever girl will cut out 14,000 pens per day, and a good slitter will *slit* 28,000. Besides the kind specially described above, many other forms are made, especially the large and small barrel pens; but the processes are all the same, or are modifications of those described. Gold pens are extensively made in Birmingham, and as they resist the corrosive action of the ink, they are very durable: their durability is also greatly increased by the ingenious but difficult process of soldering on to the points of the nib minute particles of iridium, which, from their extreme hardness, resist wear for many years. The manufacture of iridium-pointed pens is extensively carried on in the city of New York, where the process is said to have been first brought to perfection. The American manufacture, however, cannot

be made very profitable, owing to the low prices of the Birmingham pens. In gold pens the American manufacture is altogether the best. Hawkins, an American residing in England, first made the iridium-pointed pens, and solved the gold pen problem; though there were not many made on this plan until 1835–40, when Mr. Levi Brown engaged in the business, at first in Detroit, Mich., and afterwards in New York. With him was associated Mr. John Rendell, who became the inventor of a number of machines and processes by which the manufacture was simplified and improved. Bagley, Spencer, Fairchild, and Morton, became celebrated for their make of gold pens. In 1890 there were in the United States 18 gold pen and pencil manufactories, employing 363 hands, producing the value of nearly half a million dollars. This product had been more than quadrupled in the ten years following the taking of the 9th census. Fountain-pens have been in the market for a number of years, but have only recently become popular, on account of improvements in the manufacture. The stylus form is employed in some of these instruments; in others, a proper pen; and they supply ink sufficient to last for steady writing at least six or seven hours. There are 15 establishments for the manufacture of fountain pens in the U. S. and 3 for the manufacture of steel pens.

PENAL SERVITUDE is a sentence for criminal offenses which has been introduced in lieu of the sentence of transportation beyond the seas. See CONVICT; TRANSPORTATION.

PENALTY is a sum of money declared by some statute or contract to be payable by one who commits an offense or breach of contract. It is considered as a kind of punishment, and constituting indirectly a motive to the party to avoid the commission of the act which induces such a consequence. Many contracts executed between parties contain a clause that one or other of them who fails to perform his part of the contract will incur a penalty, i.e., will be liable to pay a fixed sum of money to the other party. In such cases, a distinction is drawn between a liquidated and unliquidated penalty; and whether it is of the one kind or the other, depends on the language used in the contract. If it is a liquidated penalty, then, when the breach of contract is committed, the party in default must pay that precise sum, neither more nor less; but if it is unliquidated, then he is not to pay the whole sum, but merely such part of it as corresponds to the amount of injury or damage done, and of which proportion a jury is the sole judge in an action of damages. In statutes, when penalties are declared to follow on certain illegal acts, the sum is sometimes fixed, but in many cases only a maximum sum is stated, it being left to the court or the justices who enforce the penalty what is a sufficient punishment for the offense. Sometimes penalties can only be sued for by the parties immediately injured; but, as a general rule, and unless it is otherwise restricted, anybody may sue for the penalty, for in an offense against public law, where there is no public prosecutor, any person who chooses may set the law in motion. Accordingly, not only may anybody in general sue for the penalty, but an inducement is offered by declaring the party who does so to be entitled to the whole or a half of the penalty. Without such inducement, many offenses would be unpunished. The party who so sues is generally called the informer. Thus, in offenses against the game laws, anybody may sue for the penalty, and he is entitled to half of it. Sometimes the penalty can only be sued for in the superior courts of law; but in the great majority of instances the enforcing of penalties is part of the administration of justice before justices of the peace. It is for the justices to fix the amount if they have (as they generally have) a discretion to do so. If it is not paid, the justices may issue a distress-warrant, authorizing a constable to seize and sell the goods of the party to pay the fine; and if there are no goods, then the justices may commit the party to prison as a substitutionary punishment. Sometimes justices have a discretion either to impose a penalty or commit the party to prison as an alternative punishment. All these matters depend on the construction of particular statutes.

PENANCE (Lat. *pœnitentia*), in Roman Catholic theology, means the voluntary or accepted self-inflicted punishment by which a repentant sinner manifests his sorrow for sin, and seeks to atone for the sin, and to avert the punishment which, even after the guilt has been remitted, may still remain due to the offense. Penance is believed in the Roman Catholic church to be one of the sacraments of the new law. It will be necessary to explain it briefly both under its relations as a sacrament, and as a private personal exercise.

Penance must be carefully distinguished from repentance, which is simply sorrow for evil-doing, accompanied with a purpose of amendment. Penance is the fruit or the manifestation of this sorrow, and it is commonly accompanied or expressed by some of those external acts which are the natural manifestations of any deep sorrow, either negative, as the neglect of ordinary attention to dress, to the care of the person, to the use of food; or positive, as the direct acts of personal mortification and self-inflicted pain, such as fasting, wearing hair-cloth, strewing the head with ashes, watching of nights, sleeping hard, etc. Such manifestations of sorrow, whether from motives of religion or from merely natural causes, are common among the eastern races, and are frequently alluded to in the Scripture. In the personal practice of the early Christians, penance found a prominent place, and the chief and acknowledged object of the stated fasts (q.v.), and other works of mortification which prevailed, was that of penitential correction, or of the manifestation of sorrow for sin.

A still more striking use of penance, however, in the early church, was the disciplin-

ary one; and this, in the Roman Catholic view, is connected with the sacramental character of penance. Any discussion of this purely theological question would be out of place here, and it will be enough to state briefly that Roman Catholics number penance among the seven sacraments (q.v.), and believe it to be of direct divine institution (Matt. xvi. 19, xviii. 18; John xx. 21). The *matter* of this sacrament consists, in their view, of the three acts of the penitent—contrition, or heartfelt sorrow for sin, as being an offense against God; confession, or detailed accusation of one's self to a priest approved for the purpose; and satisfaction, or the acceptance and accomplishment of certain penitential works, in atonement of the sin confessed; and the *form* of the sacrament is the sentence of absolution from sin pronounced by the priest who has received the confession, and has been satisfied of the penitential disposition of the self-accusing sinner. In all these points, of course, they are at issue with Protestants. Even in the apostolic times, the practice prevailed of excluding persons of scandalous life from the spiritual fellowship of the Christian community (see EXCOMMUNICATION); and without attempting to fix the date, it may be stated as certain, from the authority of Tertullian and other writers, that from a very early time the persons so excluded were subjected to certain penitential regulations. The class of offenders so treated were those who had been notoriously guilty of the grievous crimes of idolatry or apostasy, murder, adultery, and other scandalous offenses. The period of penitential probation differed in different times and places, but in general was graduated according to the enormity of the sin, some going so far in their rigor (see NOVATIAN) as, contrary to the clearly-expressed sense of the church, to carry it even beyond the grave. In the earlier ages, much depended upon the spirit of each particular church or country; but about the 4th c. the public penitential discipline assumed a settled form, which, especially as established in the Greek church, is so curious that it deserves to be briefly described. Sinners of the classes already referred to had their names enrolled, and were (in some churches, after having made a preliminary confession to a priest appointed for the purpose) admitted, with a blessing and other ceremonial, by the bishop to the rank of penitents. This enrollment appears to have commonly taken place on the first day of Lent. The penitents so enrolled were arranged in four grades, called—1. (Gr. *proskIaiontes*, Lat. *flentes*) "Weepers;" 2. (Gr. *akroōmenoi*, Lat. *audientes*) "Hearers;" 3. (Gr. *hypopiptontes*, Lat. *prosternentes*) "Prostrators;" 4. (Gr. *systantes*, Lat. *consistentes*) "Standers." Of these classes, the first were obliged to remain outside of the church at the time of public worship, and to ask the prayers of the faithful as they entered. The second were permitted to enter and to remain in the place and during the time appointed for the catechumens (q.v.); but, like them, were required to depart before the commencement of the solemn part of the liturgy (q.v.). The third were permitted to pray with the rest, but kneeling or prostrate, and for them were prescribed many other acts of mortification. The fourth were permitted to pray with the rest in a standing posture, although apparently in a distinct part of the church; but they were excluded from making offerings with the rest, and still more from receiving the communion. The time to be spent in each of these grades at first differed very much according to times and circumstances, but was afterwards regulated by elaborate laws, called penitential canons. Still it was in the power of the bishop to abridge or to prolong it, a power, the exercise of which is connected with the historical origin of the practice of indulgence (q.v.). Of these four grades, the first two hardly appear in the western church. It is a subject of controversy whether, and how far, this discipline was extended to other than *public* sinners; but it seems certain that individuals, not publicly known as sinners, *voluntarily* enrolled themselves among the penitents. All four grades wore a distinguishing penitential dress, in which they appeared on all occasions of public worship, and were obliged to observe certain rules of life, to renounce certain indulgences and luxuries, and to practice certain austerities. In some churches they were employed in the care of the sick, the burial of the dead, and other of the more laborious works of charity. The penitent, in ordinary cases, could only be restored to communion by the bishop who had excluded him, and this only at the expiration of the appointed time, unless the bishop himself had shortened it; but, in case of dangerous illness, he might be restored, with the condition, however, that, if he recovered from the illness, the whole course of penance should be completed. The reconciliation of penitents took place commonly in Holy Week, and was publicly performed by the bishop in the church, with prayer and imposition of hands. It was followed by the administration of communion. If any of the clergy were guilty of a crime to which public penance was annexed, they were first deposed from the rank of the clergy, and then subjected to the ordeal, like the laity themselves. This public discipline continued in force with greater or less exactness in the 5th, 6th, and 7th centuries, gradually, however, being replaced by semi-public, and ultimately by private penance. In the 11th and 12th centuries the public penance had entirely disappeared. The nature and origin of *private penance* is a subject of controversy between Catholics and Protestants; the former contending that it had existed from the first, and that it held the same place even in the ages of public penance for *secret sins* which the public penance did for public offenses. At all events, from the date of the cessation of the public discipline, it has existed universally in the Roman church. The priest, in absolving the penitent, imposes upon him the obligation of reciting certain prayers, undergoing certain works of mortification, or performing certain devotional exercises. These acts of the penitent are held to form an integral part of the sacrament of penance.

According to Protestants, penance has no countenance whatever from Scripture, and is contrary to some of the most essential principles of the Christian religion; particularly to the doctrine of justification by faith in Jesus Christ alone, on the ground of his complete or "finished" work; penance being, in fact, founded on a doctrine of—at least—supplementary atonement by the works or sufferings of man—the sinner—himself. The outward expressions of humiliation, sorrow, and repentance common under the Jewish dispensation, are regarded as very consistent with the character of that dispensation, in which so many symbols were employed. It is also held that the self-inflicted austerities, as fasting, sackcloth and ashes, etc., of Jewish and earliest Christian times, had for their sole purpose the *mortification* of unholy lusts and sinful passions in the people of God; or the expression of sorrow for sin, so that others beholding might be warned of its evil and restrained from it; all which is perfectly consistent with the principles of Christianity, if kept within the bounds of moderation and discretion. But penance in any other view, as a *personal exercise*, is utterly rejected. Arguments founded on the meaning of the two Greek words *metanoeō* and *metameleomai*, both translated in our English version *repent*, are much urged by many Roman Catholic controversialists—the former being represented as equivalent to the English *do penance;* but this is condemned by Protestants as inconsistent with the very use of the words in the New Testament itself. That penance began, as a practice, very early in the Christian church, is not only admitted by Protestants, but alleged in proof of the very early growth of those corruptions which finally developed themselves in the doctrines and practices of the Roman Catholic church, and of which Protestants also hold that there are plain intimations in the New Testament, not only prophetical, but showing the development of their germs to have already begun during the age of the apostles.

In the discipline of the Protestant churches, penance is now unknown. The nearest approach to the Roman Catholic polity on the subject was that in use among the English Puritans of the 17 c., and more particularly in the church of Scotland during that and the succeeding century, when it was common "to make satisfaction publicly on the stool of repentance" (q.v.). It does not seem to have occurred to the Reformers, or their more immediate successors in the Protestant churches, that their sytem of discipline, with its public rebukes and enforced humiliations of various kinds—as the wearing of a sackcloth robe, and sitting on a particular seat in church—was liable to be interpreted in a sense very different from that of a mere expression of sorrow for sin; but the belief is now very general among the most zealous adherents of their doctrinal opinions, that in all this they adopted practices incongruous with their creed, and in harmony rather with that of the church of Rome. Nor do they seem to have perceived that church discipline (q.v.), in its proper sense, as relating to ecclesiastical rights and privileges, is wholly distinct from the imposition of penalties by churches or church courts. Penitential humiliations, imposed by ecclesiastical authority, are now no more in favor where church discipline is most strict than where the utmost laxity prevails.

PENANG. See PRINCE OF WALES ISLAND.

PENARTH, a seaport of Glamorganshire, Wales, at the mouth of the Taff, opposite Cardiff. It was an unimportant village until 1856, when it was made a tidal harbor. Docks were built upon an extensive scale, and P. is now an important shipping port for the minerals of South Wales, especially coal, iron, and alabaster. The dock yields 6125 ft. of quayage and the tidal harbor 15,000 ft. The custom-house and dock offices are the principal buildings. Pop. '91, 12,422.

PENATES. See LARES, MANES, and PENATES.

PENCILS are instruments for writing, drawing, and painting, and they differ as much in their construction as in the uses to which they are applied. Probably the pencil was the first instrument used by artists, and consisted then of lumps of colored earth or chalk simply cut into a form convenient for holding in the hand. With such pencils were executed the line-drawings of Aridices the Corinthian, and Telephanes the Sicyonian, and also the early one-colored pictures, or *monochromata*, of the Greeks and Egyptians; but as wet colors began to be used, small fine-pointed brushes would be required, and we find it recorded that as early as the 4th c. B.C., several Greek artists had rendered the art of painting with hair-pencils so famous, that some of their pictures sold for vast sums of money. There are now in use the following kinds of pencils: hair-pencils, black-lead pencils, chalk-pencils, and slate-pencils. The first are used for painting or writing with fluid colors, either oil or water, and in China and Japan are employed almost entirely instead of pens for writing; the color used being the black or brown pigment obtained from various species of sepia or cuttle-fish. The manufacture of hair-pencils is of great importance, and requires much care and skill. The hairs employed are chiefly those of the camel, badger, sable, mink, kolinski, fitch, goat, and the bristles of hogs; and the art of pencil-making requires that these hairs shall be tied up in cylindrical bundles, so nicely arranged that all their naturally fine points shall be in one direction, and that the central one shall project the furthest, and the others in succession shall recede, so that, collectively, the whole shall form a beautifully smooth cone, the apex of which is a sharp point. Black-lead pencils are made of graphite or plumbago, which contains no lead whatever in its composition, but is in reality almost pure carbon. See BLACK-LEAD. The misnomer is probably owing to the fact that, previous to the employment of graphite for making pencils, common lead was used, and this was the case even within the present century

Consequently, as the plumbago, with its black streak, offered a contrast to the pale one of the lead, it was called in contradistinction *black-lead*.

The best graphite for drawing-pencils is found in the Cumberland mines, which have long been celebrated. Within the last twenty years, however, vast deposits of this mineral, of a very fine quality, have been discovered in Siberia and other parts of the Russian empire. Inferior qualities are found in Austria and Prussia, in Ceylon, and various parts of North America; but they are rarely used in pencil-making, except for very inferior kinds. Black-lead is rarely sufficiently free from sand and other foreign ingredients to be used without preparation; it is therefore generally ground fine, and levigated or washed until it is pure, and again formed into solid blocks by means of enormous pressure, generally in hydraulic presses; these blocks are then sawn into thin plates about the sixteenth of an inch in thickness, which are again cut across, so as to form them into small square sticks.

It may appear a very simple process to press the powdered graphite into blocks, but it was found so difficult in practice as almost to prevent the employment of this method, which has led to immense improvement in pencil-making. It was found at first that the difficulty of pressing out the contained air was so great that the presses were broken under the weight required; pressure in a vacuum was then tried, but the difficulty of applying it was found almost insurmountable, and it was certainly unprofitable. Mr. Brokedon of London, who has long been famous for his pencils, at last surmounted the difficulty by an ingenious and very simple process. This consists in compressing the black-lead into blocks 2 or 3 in. square, with only moderate pressure; these are then coated over with paper, well glued, so that when dry the covering is air-tight. A small hole is now made through this coating on one side, and several of these cubes of black-lead are put under the receiver of an air-pump, and the air being exhausted completely from them the orifice in each is closed by an adhesive wafer, which prevents the return of the air when they are taken out of the receiver. They are next placed under the hydraulic press, and a well-sustained and regular pressure is brought to bear upon them for 24 hours, after which they are found to be so completely consolidated, that in cutting them the substance is equal in density to the best specimens of unprepared graphite. There is so large a variation in the color of various qualities of black lead that by a judicious mixture of them, when in the powdered state, almost any shade of darkness can be procured; but instead of thus carefully combining different qualities of graphite it is a common practice to add sulphur or sulphuret of antimony, and by heating to procure the desired degree of blackness. For very inferior pencils the worst quality of black lead is mixed with black chalk and size, or gum-water, and formed into a paste, of which the pencil is made.

It is usual to inclose the material constituting the essential part of the pencil in a case of wood, for its protection from breakage, and to prevent its soiling the hands. The wood (generally cedar) is first sawn into thin boards, about half the thickness of the intended pencils; these are then cut into small pieces about 10 in. long by 6 in width, which are placed in the cutting and grooving machine. This machine consists principally of two circular saws—one very thin and so set that it will cut through the board; the other revolving within the eighth of an in. of it, so set as only to cut a fine square groove in the wood. By means of this machine the little boards are cut into straight square sticks, each having a groove on one surface. Into these grooves the little prepared sticks of black-lead are laid and covered with a similar piece of wood, but not grooved. A workman, who is called the "fastener-up," having glued the inner faces of the two pieces of wood, presses them together and sets them to dry; after which they are passed through the rounding-machine, dressed with a semicircular smoothing-plane, cut at the ends, and then polished by rubbing them with a piece of shark-skin. The last process is stamping them with the maker's name and the letter which designates their peculiar quality. Pencils have been recently made with covers of paper. The lead is surrounded by spiral strips of paper which are rolled on to the thickness of the usual wood-covered pencil. Pulling off the strip nearest the pencil point has the effect of sharpening the pencil.

Chalk-pencils are made in a similar manner, only that finely-powdered colored chalks, such as are used for crayons are substituted for the black-lead. Previous to pressing and cutting the chalk, it is mixed with a little hot melted wax, which gives it softness and adhesiveness.

Slate-pencils for writing on slate are made either by cutting slate into thin sticks and rounding them, or by cutting it into fine square slips, and encasing them in wood, as in the case of black-lead, etc.

PENDANT, or PENNANT, is a narrow flag of great length, tapering to a point, and carried at the head of the principal mast in a royal ship, to show that she is in commission. In the British navy the pendants are borne of three colors—red, white, or blue—according to the color to which the admiral commanding the fleet pertains. See FLAG-OFFICER. A *broad-pennant* is a blue pennant, shorter and broader than the above, carried at the mast-head of a commodore's ship, to denote that her captain is the commodore on the station. A first-class commodore hoists his broad-pennant at the fore; if of the second-class his flag flies at the mizzen.

The *rudder-pendants* are strong ropes spliced in the rings of the rudder-chain, to prevent the loss of the rudder should it by any accident become unshipped.

PENDANT, a hanging ornament, used in ceilings, vaults, staircases, timber-roofs, etc. It is sometimes a simple ball, and sometimes elaborately ornamented, and is chiefly used in the later Gothic and Elizabethan styles.

PENDEN'TIVE, the portion of a vault resting on one pier, and extending from the springing to the apex.—The word pendentive is also applied to the portions of vaults introduced in the angles of rectangular compartments, in order to reduce them to a circular or other suitable form to receive a dome.

PENDER, a co. in e. part of N. Car.; formed, 1875, from part of Hanover co., traversed by North-east Cape Fear river, and crossed by the Atlantic Coast line railroad. The surface is level, with few pine forests; soil sandy. Productions, Indian corn and cotton. Pop. '90, 12,514, includ. colored. Area, 800 sq. m. Co. seat, Burgaw.

PENDLETON, a co. in n. Kentucky, bounded on the n.e. by the Ohio river, drained also by the Licking river and many creeks; traversed by the Louisville and Nashville railroad; 310 sq. m.; pop. '90, 16,346, chiefly of American birth, with colored. The surface is rolling and the soil yields in large quantities corn, wheat, and tobacco. Lumber, cattle, and pork also are staples. Blue limestone is found. Co. seat, Falmouth.

PENDLETON, a co. in e. West Virginia, bordering on Virginia on the e. and s.w.; drained by the s. branch of the Potomac and its tributaries; between the Alleghany and Shenandoah ranges and crossed by several ridges of mountains; 650 sq. m.; pop. '90, 8711, chiefly of American birth, with colored. The surface is heavily wooded with oak, sugar maple, hickory, etc. Corn, wheat, hay, and pork are the staples. Cattle raising is extensively carried on. Co. seat, Franklin.

PENDLETON, a township of Lancashire, England, with a station on the Lancashire and Yorkshire railway, is a suburb of Manchester, and is 2½ m. n.w. of the town of that name. In 1891 the population numbered 23,866, a marked increase in thirty years. Pendleton is part of the parliamentary borough of Salford, and since 1852 it has been incorporated with the municipality of the same borough. The rapid increase of its population is due to the immense industry of the locality. The inhabitants are employed in the numerous cotton and flax mills, print and dye-works, iron foundries, soap, and chemical works, in operation here.

PENDLETON, Edmund, 1721–1803, b. Richmond, Va.; his education was self-acquired, and in 1742 he was admitted to the state bar. He was elected to the "house of burgesses" in 1752; was a member for many years and speaker when the contest between the king and colonies began. He was a delegate to the colonial congress, 1774, 1775, and presiding officer of the Virginia conventions of 1775 and 1776. The resolution instructing the state delegates to introduce in congress resolutions of independence was written by Pendleton. In the early part of the war he was president of the state committee of safety. In 1778 he was appointed chief judge of the chancery court and in 1779 of the court of appeals, which position he held for many years. In 1788 he presided over the convention which adopted the U. S. constitution, and was praised by Jefferson as the ablest man whom he had ever met in debate. Pendleton was generally regarded as the rival of Patrick Henry.

PENDLETON, George Hunt, b. Cincinnati, 1825; studied law, was admitted to the bar in Ohio, and became distinguished in his profession. He entered upon a political career on being elected to the senate of his native state in 1854 and 1855. In 1856 he was elected representative in congress, and served successively in the 35th, 36th, and 37th congresses, being a member of the house committee on military affairs during each term. In the 38th congress, to which he was also elected, he served on the committee of ways and means. He identified himself with the anti-war democrats, and attracted much public criticism on account of the boldness of his antagonism to the course of the administration. In 1864 he was nominated for the vice-presidency on the ticket with Gen. McClellan, and was defeated. In 1868 he was the western candidate for the nomination for the presidency, but was defeated by Horatio Seymour, who failed of a majority in all the western states except Kentucky and Oregon. Mr. Pendleton was one of the most prominent leaders of the "greenback" party, strongly opposing the payment of the government bonds in gold, and condemning the contraction of the currency which took place, 1865–74. He was U. S. minister to Germany, 1885–89. D. 1889.

PENDULUM, in its widest scientific sense, denotes a body of any form or material which, under the action of some force, vibrates about a position of stable equilibrium. In its more usual application, however, this term is restricted, in conformity with its etymology (Lat. *pendeo*, to hang), to bodies suspended from a point, or oscillating about an axis, under the action of gravity, so that, although the laws of their motion are the same, rocking-stones (q.v.), magnetic needles, turning-forks, balance wheel of a watch, etc., are not included in the definition.

The *simple* pendulum consists (in theory) of a heavy point or particle, suspended by a flexible string without weight, and therefore constrained to move as if it were always on the inner surface of a smooth spherical bowl. If such a pendulum be drawn aside into a slightly inclined position, and allowed to fall back, it evidently will oscillate from side to side of its position of equilibrium, the motion being confined to a vertical plane. If, instead of being allowed to fall back, it be projected horizontally in a direction perpendicular to that in which gravity tends to move it, the bob will revolve about its low-

est position; and there is a particular velocity with which, if it be projected, it describes a circle about that point, and is then called a *conical* pendulum. As the theory of the simple pendulum can be very easily explained by reference to that of the conical pendulum, we commence with the latter, which is extremely simple. To find the requisite velocity, we have only to notice that the (so-called) centrifugal force (q.v.) must balance the tendency towards the vertical. This tendency is not directly due to gravity, but to the tension of the suspending cord. In the fig. let O be the point of suspension, OA the pendulum in its lowest position, P the bob in any position in the (dotted) circle which it describes when revolving as a conical pendulum; PB, a radius of the dotted circle, is evidently perpendicular to OA. Now, the centrifugal force is directly as the radius PB of the circle, and inversely as the square of the time of revolution. Also the radius PB is PO sin. BOP, the length of the string multiplied by the sine of the angle it makes with the vertical; and the force towards the vertical is proportional to the earth's attraction, and to the tangent of the above angle—as may be at once seen from the consideration that the three forces acting on the bob at P are parallel, and therefore proportional, to the sides of the triangle OBP. Hence the square of the time of revolution is directly as the length of the string and the sine of the angle BOP, and inversely as the earth's attraction and the tangent of the same angle; or (what is easily seen to be equivalent) to the length of the string and the cosine of its inclination to the vertical directly, and to the earth's attraction inversely. Hence, in any given locality, all conical pendulums revolve in equal times, whatever be the lengths of their strings, so long as their *heights* are equal; the height being the product of the length of the string by the cosine of its inclination to the vertical. Also the squares of the times of revolution of conical pendulums are as their heights directly, and as the earth's attraction inversely.

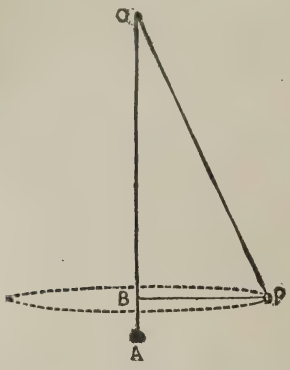


Fig. 1.

Now, *so long as a conical pendulum is deflected only through a very small angle from the vertical*, the motion of its bob may be considered as compounded of two equal simple pendulum oscillations in directions perpendicular to each other, such as it appears to make to an eye on a level with it, and viewing it at some distance, first from one point, say on the n., and then from another 90° round, say on the east. And these motions take place, by Newton's second law (see Motion, Laws of), independently. Also the time of a (double) oscillation in either of these directions is evidently the same as that of the rotation of the conical pendulum. Hence, for *small arcs of vibration*, the square of the time of oscillation of a simple pendulum is directly as its length, and inversely as the earth's attraction. Thus, the length of the second's pendulum at London being 39.1393 in., that of the half-second's pendulum is 9.7848 in., or one-fourth, that of the two-seconds' pendulum 156.5572 in., or four times that length. It follows from the principal now demonstrated, that so long as the arcs of vibration of a pendulum are all small relatively to the length of the string, they may differ considerably in length among themselves without differing appreciably in time. It is to this property of pendulum oscillations, known as isochronism (q.v.), that they owe their value in measuring time. See Horology.

That the times of vibration of different pendulums are as the square roots of their lengths, may be demonstrated to the eye by a very simple experiment. Suspend three musket balls on double threads as in the figure, so that the heights in the dotted line may be as 1, 4, and 9. When they are made to vibrate simultaneously, while the lowest ball makes one oscillation the highest will be found to make three, and the middle ball one and a half.

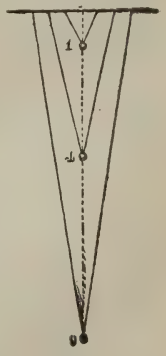


Fig. 2.

A pendulum of *given* length is a most delicate instrument for the measurement of the relative amounts of the earth's attraction at different places. Practically, it gives the kinetic measurement of gravity, which is not only by far the most convenient, but also the true measure. By this application of the pendulum, the oblateness of the earth has been determined, in terms of the law of decrease of gravity from the poles to the equator. The instrument has also been employed to determine the mean density of the earth (from which its mass is directly derivable), by the observation of its times of vibration at the mouth and at the bottom of a coal-pit. It was shown by Newton that the force of attraction at the bottom of a pit depends only upon the internal nucleus which remains when a shell, everywhere of thickness equal to the depth of the pit, has been supposed to be removed from the whole surface of the earth. The latest observations by this method were made by Airy, the present astronomer-royal, in the Harton coal-pit, and gave for the mean destiny of the earth a result nearly equivalent

to that deduced by Cavendish and Maskelyne from experiments of a totally different nature. See EARTH.

If the bob of the simple pendulum be slightly displaced in any manner, it describes an ellipse about its lowest position as center. This ellipse may, of course, become a straight line or a circle, as in the cases already considered. The bob does not accurately describe the same curve in successive revolutions: in fact, the elliptic orbit just mentioned rotates in its own plane about its center, in the same direction as the bob moves, with an angular velocity nearly proportional to the area of the ellipse. This is an interesting case of *progression of the apse* (Apsides, q.v.), which can be watched by any one who will attach a small bullet to a fine thread; or, still better, attach to the lower end of a long string fixed to the ceiling a funnel full of fine sand or ink which is allowed to escape from a small orifice. By this process, a more or less permanent trace of the motion of the pendulum is recorded, by which the elliptic form of the path and the phenomena of progression are well shown.

According to what is stated above, there ought to be no progression if the pendulum could be made to vibrate simply in a straight line, as then the area of its elliptic orbit vanishes. It is, however, found to be almost impossible in practice to render the path absolutely straight: so that there always is from this cause a slight rate of change in the position of the line of oscillation. But as the direction of this change depends on the direction of rotation in the ellipse, it is as likely to effect the motion in one way as in the opposite, and is thus easily separable from the very curious result obtained by Foucault, that on account of the earth's rotation, the plane of vibration of the pendulum *appears to turn* in the same direction as the sun, that is, in the opposite direction to the earth's rotation about its axis. To illustrate this now well-known case, consider for a moment a simple pendulum vibrating at the *pole* of the earth. Here, if the pendulum vibrates in a straight line, the direction of that line remains absolutely fixed in space, while the earth turns round below it once in 24 hours. To a spectator on the earth, it appears, of course, as if the plane of motion of the pendulum were turning once round in 24 hours, but in the opposite direction. To find the amount of the corresponding phenomenon in any other latitude, all that is required is to know the rate of the earth's rotation about the vertical in that latitude. This is easy, for velocities of rotation are resolved and compounded by the same process as forces, hence the rate at which the earth rotates about the vertical in latitude λ is less than that of rotation about the polar axis in the ratio of sin. λ to 1. Hence the time of the apparent retation of the plane of the pendulum's motion is $\frac{24 \text{ hours}}{\text{sin. } \lambda}$. At the pole, this is simply 24 hours; at the equator, it is infinitely great, or there is no effect of this kind: in the latitude of Edinburgh (56° 57′ 23.2″), it is 28.63 h., or 28 h. 37 m. 48 seconds.

We have not yet alluded to the obvious fact, that a *simple* pendulum, such as we have described above, exists in theory only, since we cannot procure either a single heavy particle or a perfectly light and flexible string. But it is easily shown that a rigid body of any form whatever vibrates about an axis under the action of gravity, acccording to the same law as the hypothetical simple pendulum. The length of the equivalent simple pendulum depends upon what is called the radius of gyration (see CENTER OF GYRATION) of the pendulous body. Its property is simply this, that if be the same as that of the complex body. The square of the radius of gyration of a body about any axis, is greater than the square of the radius of gyration about a parallel axis through the center of gravity, by the square of the distance between those lines. Now, the length of the simple pendulum equivalent to a body oscillating about any axis is directly as the square of the radius of gyration, and inversely as the distance of the center of gravity from the axis. Hence, if k be the radius of gyration of a body about an axis through the center of gravity, $\sqrt{k^2+h^2}$ is that about a parallel axis whose distance from the first is h; and the length, l, of the equivalent simple pendulum is $l = \frac{k^2+h^2}{h}$

This expression becomes infinitely great if h be very large, and also if h be very small (that is, a body vibrates very slowly about an axis either far from, or near to, its center of gravity). It must therefore have a minimum value. By solving the equation above as a quadratic in h, we find that l cannot be less than $2k$, which is, therefore, the length of the simple pendulum corresponding to the quickest vibrations which the body can execute about any axis parallel to the given one. In this case the value of h is equal to k. Hence, if a circular cylinder be described in a body, its axis passing through the center of gravity, and its radius being the radius of gyration about the axis, the times of oscillation about all generating lines of this cylinder are equal, and less than the times of oscillation about any other axis parallel to the given one. Also, since the formula for l, above given, may be thus written, $h(l-h)=k^2$, it is obvious that it is satisfied if $l-h$ be put for h. Hence, if any value l (of course not less than $2k$) be assigned as the length of the equivalent simple pendulum, there are *two* values of h which will satisfy the conditions; that is, there are two concentric cylinders, about a generating line of either of which the time of oscillation is that of the assigned simple pendulum. When $l=2k$, these cylinders coincide, and form that above described. And, since the sum of the

radii of these cylinders is l, it is obvious that if we can find experimentally two parallel axes about which a body oscillates in equal times, and if the center of gravity of the body lie *between* these axes, and in their plane, *the distance between these axes is the length of the equivalent simple pendulum.* This result is of very great importance, because it enabled Kater (who was the first to employ it) to use the complex pendulum for the determination of the length of the simple second's pendulum in any locality. The simple pendulum is perfect in theory, but cannot be constructed; and thus the method which enables us to obtain its results by the help of such a pendulum as we can construct, is especially valuable.

Compensation Pendulum.—As the length of a rod or bar of any material depends on its temperature (see HEAT), a clock with an ordinary pendulum goes faster in cold, and slower in hot, weather. Various contrivances have been devised for the purpose of diminishing, if not destroying, these effects. The most perfect in theory, though perhaps not the most available in practice, is that of sir D. Brewster (q.v.), founded upon the experimental discovery of Mitscherlich, that some crystals *expand* by heat in one direction, while *contracting* in the perpendicular one; and therefore that a rod may be cut out of the crystal in such a direction as not to alter in length by any change of temperature. In the method of correction usually employed, and called *compensation*, advantage is taken of the fact that different substances have different coefficients of linear dilatation; so that if the bob of the pendulum be so suspended as to be raised by the expansion of one substance, and depressed by the expansion of another, the lengths of the effective portions of these substances may be so adjusted that the raising and depression, taking place simultaneously, may leave the position of the bob unaffected. There are two common methods of effecting this, differing a little in construction, but ultimately depending on the same principle. Of these, the *mercurial* pendulum is the more easily described. The rod AC, and the framework CB, are of steel. Inside the framework is placed a cylindrical glass jar, nearly full of mercury, which can be raised or depressed by turning a nut at B. By increase of temperature, the steel portion AB is lengthened by an amount proportioned to its length, its coefficient of linear dilatation, and the change of temperature, conjointly—and thus the jar of mercury is removed from the axis of suspension. But neglecting the expansion of the glass, which is very small, the mercury rises in the jar by an amount proportional to its bulk, its coefficient of cubical dilatation, and the change of temperature conjointly. Now, by increasing or diminishing the quantity of mercury, it is obvious that we may so adjust the instrument that the length $\left(\frac{k^2}{h}\right)$ of the equivalent simple pendulum shall be unaltered by the change of temperature, whatever be its amount, so long as it is not great enough to sensibly change the coefficients of dilatation of the two metals. The screw at B has nothing to do with the *compensation*, its use is to adjust the length of the pendulum so that it shall vibrate in one second.

FIG. 3.

The construction of the *gridiron* pendulum will be easily understood from the cut. The black bars are steel, the shaded ones are brass, copper, or some substance whose co-efficient of linear dilatation is more than double that of steel. It is obvious from the figure that the horizontal bars are merely connectors, and that their expansion has nothing to do with the vibration of the pendulum, so they may be made of any substance. It is easily seen that an increase of temperature lowers the bob by expanding the steel rods, whose effective length consists of the sum of the lengths of A*a*, BC, and the steel bar to which the bob is attached; while it raises the bob by expanding the brass bars, whose effective length is that of one of them only; the other, as well as the steel rod *bc*, being added to the instrument for the sake of symmetry, strength, and stiffness only. If the effective lengths of steel and brass be inversely as their respective dilatation co-efficients, the position of the bob is unaltered by temperature; and therefore the pendulum will vibrate in the same period as before heating. This is on the supposition that the weight of the frame-work may be neglected in comparison with that of the bob; if this weight must be taken into account, the requisite adjustments, though possible, are greatly more complex, and can only be alluded to here. Practically, it is found that a strip of dry fir-wood, carefully varnished to prevent the absorption of moisture, and consequent hygrometric alterations of its length, is very little affected by change of temperature; and, in many excellent clocks, this is used as a very effective substitute for the more elaborate forms just described. To give an idea of the nicety which modern astronomy requires in the construction of an observing-clock, we may mention that the Russian astronomers find the gridiron superior to the mercurial pendulum; because differences of temperature at different parts of the clock case (though almost imperceptible in a properly protected instrument), may heat the steel or the mercury unduly in the latter; while, in the former, the steel and brass bars run side by side through the greater part of the length of the pendulum, and are thus simultaneously affected by any such alterations of temperature.

FIG. 4.

It would lead us into details of a character far too abstruse for the present work to treat of the effects of the hydrostatic pressure and viscosity of the air upon the motion of a pendulum.

PENDS D'OREILLES. See KALISPELS.

PENEDO, a flourishing t. of Brazil in the state of Alagoas, 185 m. s.w. of Pernambuco, on the San Francisco near its mouth. In the district, cotton, rice, and other crops are grown. Pop. of town, 9,000.

PENEL'OPE, bird. See GUAN.

PENEL'OPE, in Homeric legend, the wife of Ulysses (Odysseus), and mother of Telemachus, who was still an infant when Ulysses went to the Trojan war. During his long wanderings after the fall of Troy he was generally regarded as dead, and Penelope was vexed by the urgent suits of many lovers, whom she put off on the pretext that she must first weave a shroud for Laertes, her aged father-in-law. To protract the time she undid by night the portion of the web which she had woven by day. When the suitors had discovered this device her position became more difficult than before; but fortunately Ulysses returned in time to rescue his chaste spouse from their distasteful importunities. Later tradition represents Penelope in a very different light, asserting that by Hermes (Mercury), or by all her suitors together, she became the mother of Pan (q.v.), and that Ulysses, on his return, divorced her in consequence. But the older Homeric legend is the simpler and more genuine version of the story.

PENGUIN, *Aptenodytes*, a genus of birds of the family *alcidæ* (see AUK), or constituting the family *aptenodidæ*, regarded by many as a sub-family of *Alcidæ*, and divided into several genera or sub-genera. They have short wings, quite unfit for flight, but covered with short rigid scale-like feathers, admirably adapted for swimming, and much like the flippers of turtles. The legs are very short, and are placed very far back, so that on land penguins rest on the tarsus, which is widened like the sole of the foot of a quadruped, and maintain a perfectly erect posture. Their bones, unlike those of birds in general, are hard, compact, and heavy, and have no air-cavities; those of the extremities contain an oily marrow. The body is of an elliptical form; the neck of moderate length; the head small; the bill moderately long, straight, more or less compressed; the tail very short. Some of them have a long, slender, and pointed bill, the upper mandible a little curved at the tip, and feathered for about a third of its length; some, sometimes called gorfews or gorfous (*chrysocoma*), have a stout and pointed bill, a little curved at the tip; some, sphenisques or spheniscans (*spheniscus*), have a straight and compressed bill, irregularly furrowed at the base. The penguins are all among the most aquatic birds, although they are seldom seen very far out at sea; but it is only in the breeding season that they spend much time on shore. They are found only in the southern hemisphere, and chiefly in high southern latitudes, although some of the species extend into warm regions, as *spheniscus Humboldtii* to the coast of Peru. Of this species, which is called *Paxara niño*, or child bird, by the Peruvians, Tschudi states that it is easily tamed, becomes very sociable, and follows its master like a dog, waddling along in a very amusing manner with its plump body and short legs, keeping its balance by motions of its little wings. It displays considerable intelligence, and learns to answer to its name. In some of the furthest antarctic regions peguins are prodigiously numerous, appearing on the shore like regiments of soldiers, or, according to another similitude which has been used by a voyager, like bands of little children in white aprons. They often occupy for their breeding ground a space of several acres, which is laid out and leveled and divided into squares, as nicely as if it had been done by a surveyor; whilst between the compartments they march as accurately as soldiers on parade. The KING PENGUIN (*A. Patachonica*) a large species, of the size of the great auk, dark grayish-blue above, white beneath, with a black head and a yellow curved band on the throat, is found in such numbers on some of the sandy antarctic coasts that Mr. Bennett describes one breeding-ground on Macquarie island as covering thirty or forty acres, and, to give some notion of the multitudes, speaks of 30,000 or 40,000 birds as continually landing and as many putting to sea. On many of the antarctic shores the penguins do not flee from nor seem to dread the presence of man, remaining as if stupidly indifferent, even when their companions are knocked on the head; their very indifference, it is said, suggesting the idea of loneliness and desolation more powerfully than if there were a total absence of life. When attacked, however, they often show courage in self-defense, and are ready to run with open bill at an invader. The young are reckoned good eating; the old are said to be black and tough. The name penguin is said to be derived from the Latin *pinguis*, fat.—Penguins make no nest, but lay a single egg in a chosen place on the shore; and the egg is carefully tended both by male and female. The female penguin keeps charge of her young for nearly twelve months.—Many of the penguins are birds of bright plumage.—Cuttlefish, and other *cephalopoda*, form a great part of their food. Their voice is loud and harsh, between a quack and a bray, but there are many diversities in the different species.

PENHALLOW, SAMUEL, 1665–1726; came to Massachusetts with Charles Morton, his teacher, in 1686. Removing to Portsmouth, N. H., he was made treasurer of the province, judge of the superior court, and in 1717 chief justice. He wrote a *History of the Indian Wars of New England from* 1703 *to* 1726.

PEN-HOLDERS are small turned sticks, usually of cedar, and generally with a steel cylinder to fix the pen. They are used only for metal pens, and are now made by machinery, which is so ingenious that it turns the cedar, previously cut into square sticks,

round, often in a spiral or otherwise ornamental style, cuts them to the required length, and polishes and varnishes them.

PENICILLA'RIA. See GUINEA CORN and MILLET.

PENIKESE ISLAND. See ELIZABETH ISLANDS.

PENINSULAR STATE. See STATES, POPULAR NAMES OF.

PENITENTIAL PSALMS, seven of the psalms of David, so called as being specially expressive of sorrow for sin, and accepted by Christian devotion as forms of prayer suitable for the repentant sinner. They are psalms vi., xxxii., xxxviii., li., cii., cxxx., and cxliii., according to the authorized version, which correspond with vi., xxxi., xxxvii., l., ci., cxxix., and cxlii. of the vulgate. These psalms have been set apart from a very early period, and are referred to as such by Origen (Hom. ii., in Leviticum). Pope Innocent III. ordered that they should be recited in Lent. They have a special place in the Roman breviary, and more than one of the popes attached an indulgence to the recital of them. The most deeply penitential, and the most frequent in use, both public and private, is the 51st Psalm, or the *Miserere* (50th in the Vulgate).

PENITENTIARIES, strictly so called, are institutions for the reception of penitent women, in which confinement is purely voluntary. The name has also been applied to prisons under the separate system, having been adopted by the Quakers of Pennsylvania in 1786, when they caused the legislature of that state to abolish the punishments of death, mutilation, and the whip, and to substitute solitary confinement as a reformatory process. (See CONVICT; PRISONS.) The penitentiaries of the first-mentioned kind are often known as Magdalen asylums or female refuges. Most of the institutions of this kind in the United Kingdom are associated under the auspices of the reformatory and refuge union, an association which embraces also reformatories, industrial schools, and other like institutes. In 1877 the union had on its list 65 penitentiaries or homes for fallen women in England (15 in London), and 12 in Ireland and Scotland.

PENITENTIARY (Lat. and Ital. *penitentiariæ*), the name given to one of the offices of the Roman court, and also to the dignitary (a cardinal, called *penitentiarius*) who presides over it. The cardinal penitentiary must be a priest and a doctor of theology or canon law. He is named by the pope himself, and should the penitentiary die while the Roman see is vacant, the cardinals must be specially assembled to elect by secret scrutiny a pro-penitentiary to act for the time. The officials of the penitentiary, under the cardinal penitentiary, are a regent, three secretaries, three clerks, a corrector, a consulter in theology, and another in canon law, and one or two minor officers. The subjects which come under the notice of the penitentiary are all matters relating to the confessional, especially the absolution from sins and from canonical censures, reserved to the pope, and in certain cases dispensations from the impediments of marriage.

PENJDEH, or PUNJ DEEN, an oasis in the n.w. part of Afghanistan, 130 m. n. of Herat; lat. 36° 4′ n.; long. 62° 41′ e. It is triangular in shape, formed by the Murghab river; comprises an area of 300 sq.m.; its greatest length is abt. 27 m.; and its greatest breadth abt. 20 m. It was an integral part of the province of Herat, to which it paid tribute, and with which it is connected by a road. Its population consists of about 8000 Sariks, who occupy themselves chiefly in raising flocks and weaving carpets and fine cloths. A conflict occurred, 1885, March, between a body of Afghan troops occupying P. and a Russian force under Gen. Komaroff stationed on the neighboring boundary. The Afghans were routed, and the Russians took possession of P. This event added a serious element to the boundary dispute between England and Russia, and became the subject of special investigations, reports, and negotiations in St. Petersburg and London, accompanied with extensive military preparations; but the threatened war was averted.

PENN, JOHN, 1729–95; b. England, grandson of William and son of Richard. He was governor of Pennsylvania, 1763–71, and 1773–75; and inherited one-third of the province in 1771. He was not unfavorable to the colonial side in the revolution, but was suspected and imprisoned by congress, which finally ordered his release on parole.

PENN, JOHN, 1741–88; b. Va.; read law with Edmund Pendleton and was called to the bar. He settled in North Carolina in 1774, and was one of its representatives in congress, 1775–76, and 1778–80. He was a signer of the declaration of independence, and afterwards, during the invasion of North Carolina by Cornwallis, was at the head of the affairs of that state, of which he was receiver of taxes in 1784.

PENN, JOHN, LL.D., 1760–1834; b. England; grandson of William Penn. He was educated at Cambridge, and succeeded his father Thomas as hereditary governor of Pennsylvania in 1775. He published among other works *The Battle of Edington*, a tragedy, 1792; *Critical, Poetical, and Dramatic Works*, 1778, and *Poems*, 1801.

PENN, RICHARD, 1735–1811; b. England; brother of John. He was proprietary governor of Pennsylvania, 1771–73, and won the confidence of the colonists by his liberal course. In 1775 he carried a petition of congress to the king, and was examined by the house of lords on American affairs.

PENN, THOMAS, 1702–75; b. Penn.; son of William Penn. When about 45 years old he went to England, where he married a daughter of the earl of Pomfret. In 1746

he inherited two-thirds of the proprietary interest in the province. He was noted as the founder of the Philadelphia college and as a patron of many benevolent and literary societies.

PENN, Sir WILLIAM, 1621–70; b. Bristol, Eng.; entered the British navy, was made cap. in 1642 and admiral in 1653, the latter promotion being given him as a reward for his services in the naval contests with the Dutch. In 1655 he was prominent in the capture of Jamaica from the Spaniards. From 1655 to 1664 he remained in England, and was returned to parliament from Weymouth, but was sent to the tower on the charge of having left his command without permission. By Charles II. he was made a knight, commissioner of the navy, governor of Kinsale, and vice-admiral of the navy. In 1664 he again went to sea and was the duke of York's commander-in-chief at the great naval victory of 1665 over the Dutch. In 1669 he retired from actual service. Sir William was the father of the founder of Pennsylvania.

PENN, WILLIAM, a celebrated English Quaker and philanthropist, the founder of the colony of Pennsylvania, was the son of sir William Penn, an eminent English admiral, and was born at London, Oct. 14, 1644. His early years were spent partly in Essex and partly in Ireland, where his father had several estates. Penn studied at Christ church, Oxford, and while here was converted to Quakerism by the preaching of a disciple of George Fox, named Thomas Loe. His enthusiasm for his new faith assumed a pugnacious form. Not only did he object personally to attend the services of the church of England, and to wear the surplice of a student—both of which he considered eminently papistical—but, along with some companions who had also become Quakers, he attacked several of his fellow-students, and tore the obnoxious robes from their backs. For this unseemly procedure Penn was expelled from the university. His father was so excessively annoyed at his conduct, that he gave Penn a beating, and turned him out of doors; but he soon afterwards mollified, and sent his son to travel on the continent, in the hope that change of scene and the gayety of French life would change the bent of his mind. They failed, however, to effect this, but the youth certainly acquired a grace and suavity of address that he did not before possess. In 1666 the admiral sent him to Ireland to look after his estates in the county of Cork, which Penn did to his father's complete satisfaction; for in matters of business he was as practical an Englishman as in religion he was an out-and-out mystic. In the city of Cork, however, he again fell in with Thomas Loe, and for attending a Quaker meeting was, along with some others, imprisoned by the mayor, but was immediately afterwards released on appealing to the lord president of the council of Munster, who was personally acquainted with him. On his return to England, Penn and his father again quarreled, because the "conscience" of the former would not allow him to take off his hat to anybody—not even to the king, the duke of York, or the admiral himself. Penn was again turned out of doors by his perhaps testy, but assuredly provoked parent. The mother, however, stepped in, and smoothed matters so far that Penn was allowed to return home, and the admiral even exerted his influence with the government to wink at his son's attendance at the illegal conventicles of the Quakers, which nothing would induce him to give up. In 1668, however, he was thrown into the tower, on account of a publication entitled *The Sandy Foundation Shaken,* in which he attacked the ordinary doctrines of the Trinity, God's "satisfaction" in the death of Christ, and justification by the imputation of Christ's righteousness. While in prison he wrote the most famous and popular of his books, *No Cross, no Crown,* and *Innocency with her Open Face,* a vindication of himself, which contributed to his liberation, which was obtained through the interference of the duke of York. In Sept., 1670, admiral Penn died, leaving his son an estate of £1500 a year, together with claims upon government for £16,000. In 1671 the upright but incorrigible sectary was again committed to the tower for preaching, and as he would not take an oath at his trial, he was sent to Newgate for six months. Here he wrote four treatises; one of them, entitled *The Great Cause of Liberty of Conscience,* is an admirable defense of the doctrine of toleration. After regaining his liberty he visited Holland and Germany, along with Fox and Barclay, for the advancement of Quakerism. The countess palatine Elizabeth, the granddaughter of James I., showed him particular favor. On his return, he married, in the beginning of 1672, Gulielma Maria Springett, daughter of sir William Springett, and for some years thereafter continued to propagate, by preaching and writing, the doctrines of his sect. Circumstances having turned his attention to the new world, he, in 1681, obtained from the crown, in lieu of his monetary claim upon it, a grant of the territory now forming the state of Pennsylvania. Penn wanted to call it Sylvania, on account of its forests; but the king (Charles II.) good-humoredly insisted on the prefix Penn. His great desire was to establish a home for his co-religionists in the distant west, where they might preach and practice their convictions in unmolested peace. Penn, with several friends, sailed for the Delaware in Aug., 1682, was well received by the settlers, and on Nov. 30th held his famous interview with the Indian tribes, under a large elm tree at Shackamaxon, now Kensington. He next planned and named the city of Philadelphia, and for two years governed the colony in the wisest, most benevolent, and liberal manner. Not only Quakers, but persecuted members of other religious sects, sought refuge in his new colony, where, from the first, the principle of toleration was established by law. Having called the colonists together, he gave the infant state a constitution in twenty-four articles. Towards the end of the reign of

Charles II., Penn returned to England to exert himself in favor of his persecuted brethren at home. His influence with James II.—an old friend of his father's—was so great, that many people then, and some even yet, do not feel quite satisfied about the nature of their relations; but the suspicion that he allowed himself to be used as a tool by the court is really not justified by any known facts. It is possible, for his position was equivocal, but it is not proven, and lord Macaulay—who has urged the view of his complicity in some of the disgraceful incidents that followed Monmouth's rebellion, with an ungracious animosity—has been convicted of haste and inaccuracy in several important particulars. At any rate, his exertions in favor of the Quakers were so far successful, that in 1686 a proclamation was issued to release all persons imprisoned on account of their religious opinions, and more than 1200 Quakers were set free. In the April following, James issued an edict for the repeal of all religious tests and penalties, but the mass of non-conformists mistrusted his sincerity, and refused to avail themselves of it. After the accession of the prince of Orange as William III., Penn was twice accused of treason, and of corresponding with the exiled monarch, but was acquitted. In 1690 he was arrested on a charge of conspiracy, but was again acquitted. Nevertheless, in the following year, the charge was renewed. Nothing appears to have been done for some time, but Penn at last, through the kindly offices of his friends, Locke, Tillotson, and others, had the matter thoroughly investigated, and he was finally and honorably acquitted, Nov., 1693. Shortly after, his wife died, but in less than two years he married again. His second wife, Hannah Callowhill, was a Bristol lady. In 1699 he paid a second visit to the new world, and found Pennsylvania in a prosperous condition. His stay, which lasted two years, was marked by many useful measures, and by efforts to ameliorate the condition both of the Indians and negroes. Penn departed for England towards the end of 1701, leaving the management of his affairs to a Quaker agent named Ford, whose villainy virtually ruined Penn. When the rogue died, he left to his widow and son false claims against his master, and these were so ruthlessly pressed, that Penn allowed himself to be thrown into the Fleet in 1708, to avoid extortion. His friends afterwards procured his release, but not till his constitution was fatally impaired. Penn died at Ruscombe, in Berkshire, July 30, 1718. He left issue by both marriages. Upon the Penn controversy it is unnecessary further to enter. We refer our readers to Macaulay's *History of England* (1849–55); Hepworth Dixon's *Life of Penn* (new edit. 1856); J. Paget's *Inquiry into the Evidence of the Charges brought by Lord Macaulay against William Penn* (Edin., 1858), and Stoughton's *William Penn* (new ed., 1883).

PEN'NALISM, the name given to a practice once prevalent in the Protestant universities of Germany, which seems to have been essentially the same as the fagging (q.v.) of the English public schools. The freshmen or students of the first year (called *pennals* —i.e., *pen-cases;* fags) were considered by the elder students ("schorists") as virtually their servants. Whatever property the pennals had they must give up to the schorists, who now employed them in the meanest offices, made laughing-stocks of them, and beat and ill-used them—all which had to be endured without complaint. After a year of this discipline followed the ceremony of "deposition"—a practice older than pennalism itself, and borrowed probably from knightly consecration—in which the pennal underwent a number of symbolical trials, indicative generally of purgation from impurity and consecration to an intellectual life. Pennalism is said to have been introduced in the beginning of the 17th c., and to have been mostly confined to the Protestant universities of Germany. But although the full development of the system may have been thus restricted, germs and modifications of it were much earlier and more general, as is manifest from the prevalence of names of contempt for first year's students (see Bejan), and from statutes passed by French universities as early as the middle of the 14th c., against levying payments for first footing from them. See also Fagging. The servitude imposed on the pennals was probably an aping of the usage of chivalry, by which a candidate for knighthood had to serve for a time as page to one already a knight. All attempts to check the evils of pennalism were long unavailing, as the pennals took part with the schorists in resisting all regulations of the authorities, which would have deprived them of the hope of exercising in their turn a like tyranny upon others. Edicts against the practice were issued in Jena and other universities about the beginning of the 17th c., but it was not till the last half of the century that the universities, by uniting in severe measures, were able to check the evil; and traces of it survived for a long time afterwards. In imitation of the students, a kind of pennalism was adopted by other bodies, more particularly by the printers, who retained the ceremony of "deposition" after it had disappeared from the universities.—Schöttgen, *Historie des Pennalwesens* (Dresd. 1747).

PENNANT, Thomas, ll.d., tourist, naturalist, and antiquary, was b. June 14, 1726, at Downing in Flintshire, and educated at Queen's and Oriel colleges, Oxford. His first important publication was the *British Zoology* (1761–69), which contained in all 132 plates on imperial paper, engraved by Mazel, and established his reputation. While the work was in course of publication, Pennant made a trip to the continent, and saw some of the scientific and literary celebrities of the time, as Buffon, who has favorably mentioned him in his great work on *Natural History*, Voltaire, Haller, the two Gesners, and Pallas. In 1769 he made the first of his famous tours in Scotland, penetrating to the

remotest part of the country, which, he says, was then "almost as little known as Kamtchatka." He returned with a very good opinion of it, and published his report in 1771, in consequence of which (according to him) Scotland has "ever since been *inondée* with southern visitants." The year before, he added 103 plates to his *British Zoology*, with descriptive notices; and in 1771 printed at Chester his *Synopsis of Quadrupeds*, subsequently enlarged and improved under the title of *History of Quadrupeds*. Of this work Cuvier says: "It is still indispensable to those who wish to study the history of quadrupeds." In the same year the university of Oxford conferred on him the degree of LL.D. Next year he undertook his second and most important tour in Scotland, which included a voyage to the Hebrides (an account of which appeared in 3 vols. 1775). Pennant was warmly welcomed by the inhabitants. Almost every corporated town paid him some formal compliment, and he returned "rich in civic honor." In 1773 he published his *Genera of Birds*, and made an antiquarian tour through the north of England. His subsequent tours through Wales do not require special notice. In 1777 appeared a fourth volume of his *British Zoology*, containing the vermes, the crustaceous, and the testaceous animals of the country. Among a great variety of later miscellaneous publications, we may mention in particular an amusing life of himself (*The Literary Life of the late Thomas Pennant, Esq., by himself*, 1793). He died Dec. 16, 1798.

PENNAT'ULA, a genus of zoophytes (*anthozoa*), allied to gorgonia (q.v.) and *alcyonium* (q.v.), and having very similar polyps; but the polyp mass is not fixed by its base, has a fleshy stem strengthened by a bone, and a skin containing calcareous spiculæ, the upper part of the stem winged on two sides, with numerous pinnæ, along the upper margins of which the polyp-cells are ranged. The whole form somewhat resembles a quill, so that the popular name SEA PEN is very often given to these zoophytes. One species *pennatula phosphorea*, is common on the northern parts of the British coast. It is from two to four inches in length, of a purplish-red color, and like many—perhaps all—of the other species, is sometimes brilliantly phosphorescent, emitting flashes of light when disturbed, but ceasing to be luminous on relapsing into quiescence. The stalk is hollow in the center, and the bone which it contains—and which is composed of phosphate and carbonate of lime, like the bones of the vertebrate animals—is a very remarkable part of its structure, not extending the whole length of the stalk, slender, straight, and perfectly simple, but bent backwards at each end into a hook. Other species are found in the Mediterranean and other seas, some of them more pen-like than even the British one. It has been alleged that they swim by contractions and dilatations of their common fleshy substance, or by movements of the pinnæ; but there is no good evidence of their possessing any such power of locomotion, which is very contrary to the analogy of all similar zoophytes, and more probably the opinion prevalent among the fishermen of the Scottish coasts is the correct one, that their natural place is at the bottom of the sea, with the somewhat flexible lower end of the stalk immersed in mud. Nearly allied to the pennatulæ is another genus of extremely beautiful zoophytes, *virgularia*, ranked with them in the family *pennatulidæ*, and sometimes receiving the name SEA RUSH.

PENNINGTON, a co. in s.w. S. Dakota; formed, 1875; organized, 1877. Area, 1521 sq.m.; pop. 1890, 6540. Co. seat, Rapid City.

PENNINGTON, WILLIAM SANFORD, 1757–1826; b. N. J.; served as a maj. of artillery in the revolution. In 1802 he was admitted to the bar; in 1804 became an associate judge of the supreme court, N. J.; and, 1813–15, was governor of the state; 1815–26, U. S. district judge. He was the author of *Supreme Court Reports*, 1803–26, 8vo, 1825.

PENNON, a small pointed flag carried by the mediæval knight on his lance.

PENN'S CAVE, a remarkable limestone cavern in Centre co., Pa., 14 miles e. of Bellefonte. It is more than a mile in length, with two principal corridors, one covered by a stream of water and the other, "Dry Cavern," branching off at right angles.

PENNSYLVANIA, a middle state of the Atlantic slope, one of the original 13, and the second in population; between lat. 39° 43′ and 42° 15′ n.; long. 74° 43′ 36″ and 80° 31′ 36″ w.; bounded on the n. by lake Erie and New York; on the e. by New York and New Jersey, from which it is separated by the Delaware river; on the s.e. by Delaware for a few m.; on the s. by Maryland and West Virginia; on the w. by West Virginia and Ohio. Its form is very regular, the boundaries of three sides being lines of latitude and longitude; its length from e. to w. is 302.34 m.: its breadth 175.6 m.; land area, 44,985 sq. m.; gross area, 45,215 sq. m., or 28,937,600 acres. It is called the Keystone State from its position and importance among the original thirteen.

HISTORY.—The first visitor of Delaware bay was Capt. Henry Hudson, in 1609; lord de la Warr, however, in honor of whom the bay and river are named, accidentally discovered its mouth in 1610. The Dutch built Fort Nassau on the Delaware river in 1623; but the first actual settlement was by Swedish colonists at Tinicum island in 1643. In 1655 the Dutch from New Amsterdam took possession of the whole territory between the Delaware and the Hudson river, and held it until 1664, when New Netherlands was conquered by the English; recovered by the Dutch in 1673, it reverted to British rule in 1674. The first European settlement was Fort Nassau, near

Gloucester, in New Jersey. Fort Oplandt was built near Lewistown, Delaware. The first Dutch settlers were murdered by the Indians; but the Swedes, who followed and settled on the w. bank of the Delaware, were more successful, but their success involved them in trouble with the Dutch, to whom they finally succumbed. In 1681 a charter for the territory 12 m. n. of New Castle to 43° n.e., bounded e. by the Delaware river, and to extend w. 5° in long. to the same degree of lat., was granted to William Penn, who landed at New Castle Oct. 27, 1682, and founded Philadelphia. His advent was auspicious, and his humane treatment of the Indians and the colonists caused the new colony to flourish. In 1684 there were already upwards of 300 houses in Philadelphia, with a population of 2500, and of 7000 in the province and territory. Penn was temporarily deprived of his possessions under William and Mary, and did not revisit the province until 1699. He returned to England in 1701, and died there in 1718. His widow administered the government for a while, but it passed to his children and their descendants, and the proprietary government continued until the revolution, in 1776; the affairs of Delaware (called the lower cos.) after 1699 were administered by a separate legislature under the governors of P. Between 1715 and 1725 there was a large immigration of Scotch-Irish. By charter right P. above lat. 41° belonged to Connecticut, and as the Penns had not settled it, a large portion was purchased in 1768 from the Six nations by a land association called the Connecticut Susquehanna company, and fresh settlements were begun in the Susquehanna and Delaware valleys, which were broken up by the Indians. In 1769 emigrants from Connecticut again entered, but the Indians had meanwhile resold the region to the P. proprietaries. Connecticut, however, maintained her rights, and in 1776 the co. of Westmoreland was organized under the laws of Connecticut, and was represented in the legislature of that state. The Indian massacres that had desolated P. in 1755–56 and 1763 broke out again, and in 1778, June 30, the massacre of Wyoming occurred. (See Wyoming Valley.) The boundary difficulties between P. and Maryland were settled by the survey of Mason and Dixon, begun in 1763 and ended in 1767, but the disputes with Connecticut continued till 1781, when, by a somewhat high-handed decision of a court of arbitration, the lands claimed and settled by Connecticut were adjudged to P. The development of P. during the first century of its existence may be seen by the settlement of more than 12 cos., and the founding of Philadelphia in 1682; Lancaster, 1729; York, 1740; Reading, 1748, and Carlisle in 1750. A newspaper, the *American Weekly Mercury*, was published in Philadelphia in 1719; in 1756 stage-coaches were established from Philadelphia to New York and Baltimore, and in 1757 the postal service was extended to Carlisle. The first continental congress met in Philadelphia Sept. 5, 1774. P. was foremost in resisting British encroachments, and led in all the momentous events of the revolution; independence was proclaimed on her soil, 1776. The battle of Germantown (q.v.) took place Oct. 4, 1777. Washington went to Valley Forge in December of that year. March 1, 1780, slavery was abolished. Philadelphia was the seat of government throughout the proprietary period (save for short intervals). The capital was removed to Lancaster in 1799, and remained there until 1812, when Harrisburg was selected as the permanent capital. The corner-stone of the capital was laid May 31, 1819.

The first gov. under the state constitution was Thomas Mifflin. The land of the province, although granted by royal charter, was bought by Penn, the proprietary government, and the state, of the Indians in six successive purchases: "the walking purchase" on the Delaware in 1682; the s.e. section of the province in 1736; a section running from Pike to Dauphin co. in 1749; a tract extending from Northumberland to the southern boundary in 1758; an enormous tract from the n.e to the s.w. extremities of the province in 1768; and the whole n.w. section by state commissioners in 1785. Lands obtained by the Indian treaty of 1768 were offered at £5 per 100 acres, and one penny per acre per annum quit-rent; some of the richest coal land was offered at that price. The settlement of the western country began about 1784, in which year there were at Pittsburg four lawyers and two doctors, but no minister of religion. Ten years later the population was still below 500. The triangular tract of land bounded n.w. by lake Erie was purchased in 1788 from the U. S., and the settlement of that part of the state was subsequent to that year. The whiskey rebellion, in 1794, was caused by a law of congress, passed in 1790, imposing excise duties on spirits distilled in the U. S. The tumultuous opposition to it was especially violent in western P., and attended by great disorders, which led pres. Washington to invite the military aid of Pennsylvania, New Jersey, Maryland, and Virginia for their suppression. The appearance of a body of 12,000 troops, led by Gov. Lee, was sufficient, without bloodshed, to quell the difficulty. In 1825 the Susquehanna and Delaware rivers were connected by canals, and in 1834 the Columbia line of combined railroad and canal was opened to Pittsburg. During the civil war the confederates made three invasions into P., the first of which was a raid, under Gen. Stuart, who burned the railroad depot at Chambersburg, Oct. 10, 1862; the second, under Lee, brought the whole confederate force in Virginia into the state, and culminated in the battle of Gettysburg, July 1–3, 1863 (see Gettysburg); the third, executed by a small force of Early's division, burnt the town of Chambersburg, July 30, 1864. During that war P. furnished the national army with 270 regiments, and a total of 337,936 men, besides 25,000 militia for temporary service. The establishment of "soldiers' orphan schools," for the maintenance, clothing, and education, at the public

AREA AND POPULATION OF PENNSYLVANIA BY COUNTIES.

(ELEVENTH CENSUS: 1890.)

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Adams	535	33,486	Lancaster	965	149,095
Allegheny	750	551,959	Lawrence	370	37,517
Armstrong	615	46,747	Lebanon	360	48,131
Beaver	463	50,077	Lehigh	350	76,631
Bedford	1,000	38,644	Luzerne	920	201,203
Berks	901	137,327	Lycoming	1,195	70,579
Blair	524	70,866	McKean	1,065	46,863
Bradford	1,150	59,233	Mercer	660	55,744
Bucks	610	70,615	Mifflin	375	19,996
Butler	795	55,339	Monroe	625	20,111
Cambria	680	66,375	Montgomery	480	123,290
Cameron	382	7,238	Montour	130	15,645
Carbon	412	38,624	Northampton	380	84,220
Centre	1,145	43,269	Northumberland	493	74,698
Chester	764	89,377	Perry	550	26,276
Clarion	580	36,802	Philadelphia	130	1,046,964
Clearfield	1,079	69,565	Pike	620	9,412
Clinton	850	28,685	Potter	1,070	22,778
Columbia	480	36,832	Schuylkill	816	154,163
Crawford	1,010	65,324	Snyder	325	17,651
Cumberland	560	47,271	Somerset	1,106	37,317
Dauphin	510	96,977	Sullivan	446	11,620
Delaware	200	74,683	Susquehanna	850	40,093
Elk	760	22,229	Tioga	1,120	52,313
Erie	770	86,074	Union	315	17,820
Fayette	830	80,006	Venango	655	46,640
Forest	410	8,482	Warren	855	37,585
Franklin	750	51,433	Washington	890	71,155
Fulton	435	10,137	Wayne	738	31,010
Greene	640	28,935	Westmoreland	1,035	113,819
Huntingdon	890	35,751	Wyoming	396	15,891
Indiana	830	42,175	York	910	99,489
Jefferson	640	44,005			
Juniata	410	16,655	Total	44,985	5,258,014
Lackawanna	460	142,088			

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charge, of the children of soldiers who fell in defense of their country, redounds to the credit of the commonwealth ; the number of children thus provided for exceeded 7,000.

Topography.—The state is hilly and mountainous in the centre, rolling in the w., level in the s.e. A number of parallel ridges, with a maximum height of 2500 ft., cross it from n.e. to s.w.; they are all members of the Appalachian system and cover about one fourth of the entire area of the state. Next w. of the South mountain, on the Delaware, below Easton, are the Kittatinny or Blue mountains ; then the Broad mountains, s. of the n. branch of the Susquehanna ; the Tuscarora w. of that river ; the Sidling hills s. of the Juniata ; the Alleghany mountains ; the Chestnut and Laurel Hill ridges. The breadth of the entire mountain system of the state exceeds 200 m.; it forms numerous beautiful and fertile valleys, and encloses the richest coal fields and iron deposits in the union ; the valleys mostly conform to the general trend of the mountains ; the rivers follow similar lines, but often traverse the valleys obliquely. The Delaware enters the state about lat. 42°, and continues from that point throughout its course to Marcus Hook, as the boundary between P. and New Jersey. The river was named after lord de la Warr, who visited the bay in 1610 ; the Indians called it *Poutaxas, Marisqueton, Makeriskitton*, etc. Its length is 300 m. At the Water Gap it breaks through a narrow gorge, whose sides rise perpendicularly to near 1200 ft., and presents a truly grand spectacle. At Easton it receives the Lehigh, 90 m. long, a beautiful, rapid, and romantic stream, rising in the coal region ; the Lehigh Water Gap, below Mauch Chunk, is a very picturesque spot. Mauch Chunk, Allentown, and Bethlehem are on the Lehigh. Sixty m. s. of Easton the Delaware, with a fall of about 160 ft., reaches tide-water at Trenton ; 35 m. farther s.w. passes Philadelphia, below which city it receives the Schuylkill (Indian name, Mai-nai-unk), a stream 120 m. long, rising in the coal regions, peculiarly rich in tributaries, which passes Pottsville, Reading, Norristown, and Manayunk. Chester, New Castle, and Delaware city are below Philadelphia. (For Delaware bay, see Maryland and New Jersey.) The Susquehanna, though its n.e. branch rises in New York, is emphatically the river of P.; besides the n.e. branch it consists of the w. branch and the Juniata, and drains about 22,000 sq.m. The n.e. branch, after flowing 250 m. from its rise in Otsego lake, and receiving the Chemung or Tioga and the Lackawanna, through the beautiful Wyoming valley, unites below Northumberland with the great w. branch (200 m. long from its rise in Cambria co.), pursues its course s., until it receives the Juniata (150 m. long from its rise in the eastern slopes of the Alleghany mountains), and then turning s.e. empties, after an entire course of 500 m., into the Chesapeake bay. This river and its tributaries, justly famed for great beauty, pass through the richest and most fertile regions of the state. The two great rivers w. of the Alleghany mountains, whose junction forms the Ohio, are the Alleghany and Monongahela ; the former rising in Potter co., flows 50 m. n.w. into New York, and turning s.w. re-enters P., in Warren co., receives the Clarion river, Red Bank creek, the Kiskiminetas or Conemaugh on the left, and French and Conewango creeks on the right, all very important streams ; the Alleghany, from the point at which it re-enters the state, to that of its junction with the Monongahela at Pittsburg, is 180 m. long. The Indians called both the Ohio and the Alleghany by the latter name, the former designating in the language of the Delawares "Fair Water," just as the latter had the same meaning in that of the Senecas. The Monongahela is formed by two branches, the Monongahela proper and the Cheat river, both of which rise and flow n. in W. Virginia for a distance of 100 m.; these branches unite in Fayette co., Pa., and the river then flows n. 80 m.; at McKeesport it receives the Youghiogheny from the s.e., about 160 m. long, and in a n.w. course of 18 m. forms by the confluence with the Alleghany, which meets it from the n., the Ohio river at Pittsburg. The Ohio flows 25 m. n.w. to the mouth of the Big Beaver (the recipient of several tributaries, which together drain an area of about 6000 sq.m.), and then turning s.w. it leaves the state in Beaver co. Almost all the rivers break through the mountain chains and give natural access to its mineral and agricultural wealth. The Delaware is navigable for vessels of largest size to Philadelphia ; for steamboats to Trenton ; for smaller craft to Easton. The Susquehanna is not navigable in the state for steamboats, but both the Alleghany and Monongahela are navigable for 60 m. from their confluence, while the Ohio is one of the great water-ways to the Mississippi. There are no great lakes in P., but it borders lake Erie for 45 m., and has an excellent harbor at Erie.

Geology.—The state is occupied by azoic, mezozoic and palæozoic formations. The first prevails mostly in the south-eastern portions, crossed by the second in a belt of about 25 m. in a line from New Jersey to Maryland ; while the palæozoic marks the rest of the state. The latter may be found classified in the geological report of H. D. Rogers. Special localities indicate the presence of drift in the shape of gravel in the northern and n.w. tier of cos. Gneiss abounds in the s.e. portions of the state, and occupies a tract from Trenton to Philadelphia and up the Schuylkill ; it runs through portions of Delaware and Chester cos., traverses Northampton, Berks, Lebanon, parts of Lancaster, Dauphin, and reappears in Adams co., where it meets a similar formation along the border of the state. Within this extensive tract are found marble quarries (Philadelphia), lead and copper (Phœnixville), nickel (Lancaster co.), magnetic iron ore (Warwick, Cornwall, and other numerous points in Berks, Lebanon, and Lancaster cos.); chrome iron ore is mined in the serpentine barrens near Octoraro creek, in Lancaster co. The lower Silurian

in Lancaster, Berks, and Lehigh cos., and many central sections of the state contains vast deposits of hematite iron. New red sandstone is found in a belt of country whose northern limits stretch in a line from Durham near the Delaware across the Schuylkill below Reading, and the Susquehanna below Harrisburg to near Waynesburg; while its southern limits run on a line from Trenton, Norristown, through Lancaster co. and into Adams co. Sandstone, red shale, trap-rock, abound throughout the district; the sandstone is excellent for building purposes, and utilized for that purpose. The lower members of the palæozoic series above described dip n.w. under the auroral magnesian lower Silurian limestones, flanked by the Kittatinny and Blue mountains on the one hand, and the South mountain on the other. The entire region is very fertile, and embraces some of the richest agricultural districts of the state in the counties of Northampton, Lehigh, Berks, Lebanon, Dauphin, Cumberland, and Franklin. A similar belt of limestone country runs through Lancaster co., and in part through York; a narrow band of the same formation traverses likewise Montgomery and Chester counties. Roofing slate is found and extensively quarried in Northampton and Lehigh counties. Limestone areas are scattered in Montour, Clinton, Snyder, and Mifflin counties, and the Juniata valley, continuous in Centre co.; they extend also in a s.w. line through Blair and Bedford counties to the Maryland border. The upper Silurian and Devonian run n. and n.w. to the Alleghany mountains. The ridges in well-marked parallels, traversed by rivers and diversified by fruitful valleys, present a scenery of romantic beauty and a subalpine character, and show the different members of the gigantic palæozoic formation. The general features of that hill-region are much the same to the Alleghany mountains, w. of which they are entirely changed; round knolls, short and broken ridges, distinguish the bituminous coal region. The coal measures c. of the Alleghany stretch in three parallel beds—the northern, from Carbondale through Scranton and Wilkesbarre to the w. of Newport; almost due s. of it is found the Lehigh coal field; still farther s.w. from Mahanoy city, through Ashland and Shamokin, to within a short distance of the Susquehanna, lies the second or middle anthracite coal field, while the southern, with Pottsville in the center, extends continuously from Mauch Chunk, on the Lehigh, to Wiconisco, and by southern branch to within a short distance from the Susquehanna. The semi-bituminous coal field is in the region of the Broadtop mountain in Huntingdon and Bedford cos. The Alleghany mountains form the eastern limit of the vast bituminous coal fields which overspread the greater part of the western section of the state. Sandstone, iron ore, limestone, and fire-clay interstratify with the coal. Limestone occurs to a limited extent in the Alleghany valley, but is found more copiously in the upper portions of the Monongahela. At Johnstown, Brady's Bend, and in Westmoreland and Fayette counties ironstone is mined; and the charcoal furnaces of Armstrong, Butler, and Clarion cos. absorb large quantities of limonite. See IRON.

What is known as the Appalachian oil field comprises parts of Pennsylvania, New York, West Virginia, and Ohio. The entire field has over 7,000 wells, and the annual shipment since 1889 has averaged 33,000,000 barrels, the proportion of Pennsylvania being over one-half. The first well opened began its production on Aug. 30, 1859. The oil of P. is found in porous sandstones beneath strata 400 to 2200 ft. thick. See PETROLEUM.

Salt wells are worked in the valley of the Kiskiminetas or Conemaugh river on an extensive scale, and that industry is capable of vast development, as salt springs are not only very abundant in w. P., but exist in Susquehanna, Lycoming, Clearfield, and Bedford cos. The highest recent production was 280,343 barrels, in 1893.

ZOOLOGY.—Among wild animals are the deer, black bear, panther, lynx, wolf, red, and gray fox, raccoon, sable, pine marten, otter, mink, gray rabbit, opossum, porcupine, woodchuck, skunk, cat-squirrel, flying squirrel, ground squirrel, and stoat. The birds and wild-fowl are mainly such as are found in New York and New Jersey, and include the golden eagle, bald eagle, turkey buzzard, great horned owl, screech owl, fish hawk, heron, whippoorwill, night hawk, mocking-bird, cedar bird, logcock, swallow, and scarlet tanager. Among reptiles are the rattlesnake and black snake.

BOTANY.—The Alleghanies produce almost every species of timber except white oak. White pine, poplar, beech, sugar-maple, chestnut, and birch are most abundant. The first predominates chiefly on the eastern slopes of the mountains; wild cherry, walnut, hickory, and oak are frequent; chestnut predominates on the Chestnut ridge and Laurel hill region, which yields also red and rock oak. In the valleys and along the watercourses, hickory, ash, sugar-maple, cherry, elm, and sycamore of majestic growth flourish. Sugar-maple and beech fill the forest in the vicinity of lake Erie, hemlock in Clearfield, Cambria, etc., beech in the Lehigh region. Among the noticeable shrubs that adorn the woods with their blossoms are the rhododendron and laurel. Severe penalties are imposed for the wanton destruction of trees.

CLIMATE AND SOIL.—The climate of the state is different in its three natural divisions of eastern, western, and northern. The eastern section is marked by irregular alternations of the seasons; the mean extremities of notation for a great number of years being 5° below zero and 100° Fahr.; there are seldom more than 30 days of above 80° heat in summer and below 30° in winter. Sudden changes are of frequent occurrence—intensely hot or cold weather seldom lasts more than 3 days continuously. The period from the middle of Jan. to that of Feb. is generally the coldest, and from the beginning of July to

middle of Aug. the hottest. In the western section the fluctuations are more abrupt, and heat and cold more excessive. In the northern section and the mountainous regions of the entire state the winters are very severe, with an extreme temperature as low as 20° below zero; the summers delightfully cool. The climate is decidedly healthful, although malaria lingers in the river valleys, along canals, and in swampy regions.

The yearly mean temperature at Gettysburg is 50.63°; at Harrisburg, 53.73°; at Philadelphia, 52.1°; at Alleghany, 51.19°; the average annual rain-fall at Pittsburg is 37.09 ins., at Philadelphia, 44.05 ins. The soil is generally very fertile, especially in the central and western cos., being composed, to a great extent, of disintegrated limestone, and arable lands extend to the summits of the lower mountains. The lands in the n. are better for grazing than for agriculture.

AGRICULTURE.—Pennsylvania had, in 1890, 18,364,370 acres of farm land, valued at nearly $1,000,000,000, and with an annual product of $130,000,000. In the production of rye it ranks first among all the states of the Union, with over 4,500,000 bushels a year. Still greater crops are those of corn, oats, wheat, buckwheat, potatoes, and hay. The southeastern counties are rich in loam of great fertility, and the remoter valleys inland are remarkably productive. Chester is famous for its nurseries; and the dairy products of the state have immense value. In 1896 there were over 4,000,000 head of live stock (cattle, sheep, swine, and horses) in the state. Fruit trees of almost every species abound, and the grape is extensively cultivated. The culture of tobacco in Lancaster and other cos. is extensive and profitable, and Pennsylvania now ranks sixth among the tobacco-growing states with a crop of over 16,000,000 pounds per annum.

MANUFACTURES, ETC.—According to the census of 1890, the manufacturing interests of this state place it second as to the capital invested and the number of establishments; second also as to the value of products. The reports showed 39,336 establishments, $990,999,375 capital, 620,484 persons employed, $305,556,229 paid for wages, and $773,530,105 for materials, and $1,331,523,101 value of products. Besides the leading industries of coal, iron, and petroleum, the minor ones in which the state ranked first in the United States included paper bags, rag carpets, carpets other than rag, woolen goods of every description, glues, railroad cars, dentists' materials, drugs and chemicals, gunpowder, leather, dressed skins and tanned. In the amount of lumber produced, Pennsylvania is second only to Michigan. The lumber shipments from the two chief emporia at Williamsport and Lock Haven are enormous. In manufacturing iron, Pennsylvania leads all the states, and produces as much as all of them combined. The first blast-furnace in the state was opened by William Penn, on the Delaware river in 1688. The first forge went into operation at Coventry, in Chester co., in 1720. The first puddling and rolling mill was set up at Plumsock, Fayette co., in 1817. In 1895, Pennsylvania ranked fourth in the production of iron ore, the output being over 900,000 long tons, valued at nearly $1,000,000; and first in production of pig iron (nearly 5,000,000 long tons) and Bessemer steel (nearly 3,000,000 long tons). The coal regions of Pennsylvania are the richest in the world, and in 1895 yielded 56 per cent. of all the coal mined in the United States, or over 96,500,000 long tons. The anthracite mines are divided among seven districts, — Pittston, Wilkesbarre, Hazelton, Shenandoah, Ashland, Pottsville, and Scranton. The bituminous mines are divided among eight districts,—Monongahela City, Irwin, Mercer, Towanda, Connellsville, Johnstown, Idlewood, and Phillipsburg. Pennsylvania supplies the fastest ships of the North-German Lloyd, American, Cunard, Hamburg-American, and French lines with the picked coal on which they depend in their record-breaking trips. The largest quantity of coke is produced in the Connellsville region. Prosperous manufacturing centers are Philadelphia with 18,000 factories, 260,000 operatives, and an annual output worth $577,000,000; Pittsburg, which is one of the most important manufacturing cities in the world in brass, iron, steel, copper, glass, and paper, and with the natural-gas region about it; Reading, with its immense repair-shops and rolling-mills; Scranton, with steel-works and collieries; Harrisburg, manufacturing goods worth $10,500,000 a year; Lancaster, York, Easton, Chester famous for its shipbuilding, Allentown, Altoona, Erie, Meadville, New Castle, Norristown, Phœnixville, Bristol, Pottsville, Carbondale, Bradford, Titusville, Oil City, and Corry. See IRON; OIL-WELLS; PIPE-LINES; COAL.

COMMERCE. — Philadelphia and Erie are the ports of entry, and control a considerable amount of foreign commerce. Philadelphia has four lines of European steamers and numerous coast lines, thus making it one of the prominent ports on the Atlantic coast. The imports amount to over $39,000,000 annually, the domestic exports to over $42,000,000. Erie has one of the best harbors on Lake Erie, and carries on a large import trade in Michigan iron and Canadian lumber, and exports large quantities of coal. Pittsburg also, at the eastern head of navigation on the western rivers, has an immense inland trade, while its local ship-yards build large numbers of steamboats for use on the western rivers.

TRANSPORTATION. — The state ranks second in railroad mileage, the total length of lines operated being about 10,000 miles, exclusive of sidings. The various companies have a combined capital stock of over $560,000,000; funded debt, $578,000,000; and a total investment of $1,216,500,000; the cost of road and equipments was about $800,000,000; gross earnings, $150,000,000; net earnings, over $50,000,000. Interest payments on bonds aggregate over $25,000,000, and dividends on stocks, $15,500,000. Passenger traffic yields over $26,500,000, and freight traffic, $115,000,000. The principal road is the Pennsylvania, which, by lease, operates about 50 roads in all, capitalized at over $200,000,000, having a funded debt of $166,500,000, and covering nearly 2,700 miles.

Other important roads are the Philadelphia and Reading; the Lehigh Valley, the Pittsburg, Cincinnati, Chicago, and St. Louis; the Baltimore and Ohio, the New York, Lake Erie, and Western; the Philadelphia, Wilmington, and Baltimore; the New York, Susquehanna, and Western; the Delaware, Lackawanna, and Western; the Philadelphia, Reading, and New England; the Western New York and Pennsylvania; and the Pittsburg, Fort Wayne, and Chicago. The Pennsylvania, begun in 1847, from Philadelphia to Pittsburg, has some remarkable examples of engineering skill, and is also famous for its magnificent and impressive mountain scenery. The Philadelphia and Reading, besides a large passenger traffic, carries an enormous amount of freight, principally coal. The Erie crosses the Alleghany mountains in this state at an elevation of 2500 feet, which is the highest point crossed by any standard railway line east of the Rocky mountains. The Baltimore and Ohio have a widespread system in this state from Philadelphia on the east to Pittsburg and Johnstown on the west. The canal and slack-water navigation of the state, including the canals partly in New York and New Jersey, comprises about 725 miles, mostly owned or operated by railroad and coal-mining corporations. The operating canal and navigation companies are capitalized at nearly $60,000,000, and their canals and betterments have cost over $30,000,000. The state expended large sums in canal construction, but the rapid extension of the railroad system has caused many such water-ways to be abandoned.

Banks.—In 1896 there were 420 national banks in operation, with a combined capital of $74,805,820, deposits $240,539,135, and reserve $67,025,870; 83 state banks, with capital $8,415,050, deposits $40,086,517, and resources $57,022,931; 88 loan and trust companies, with capital $39,976,237, deposits $101,812,081, and resources $199,567,309; 16 mutual savings banks, with depositors 282,677, deposits $73,937,636, and resources $83,272,567; and 31 private banks, with capital $1,477,525, deposits $6,371,614, and resources $8,586,171. The exchanges at the clearing house at Philadelphia aggregated over $3,383,903,000, and at Pittsburg, over $773,000,000. The Bank of North America, founded in 1781, is still in active operation in Philadelphia. The First National Bank of Philadelphia is also historical as being the first bank in the U. S. chartered under the National Bank Act of 1862.

Churches, Education, etc.—In 1890 there were 10,175 church organizations, 9,624 church edifices, 780 halls used for religious purposes, 1,726,640 communicants, and church property valued at $85,917,370. The leading denominations numerically are the Roman Catholic, Methodist Episcopal, Presbyterian, Lutheran, Reformed church, Baptist, Protestant Episcopal, Evangelical Association, United Presbyterian, United Brethren, and Brethren (Dunkards).

The public school system is supervised by the superintendent of public instruction, appointed for four years, and by co. superintendents, elected for three years. The school population exceeds 1,625,000; the enrollment in public schools, 1,106,000; the average daily attendance, 780,000; the number of public school houses, 14,600; the estimated value of all public school property, $46,500,000; annual expenditure, $19,000,000. In many thinly settled sections, township authorities have closed small district schools and established large ones with city school grades in central localities, conveying distant pupils at the expense of their district. In the large cities public school affairs are managed by local superintendents and boards of education. Nearly $10,000,000 have been spent by the state in schools for soldiers' orphans. The Drexel Industrial Institute, opened at West Philadelphia in 1891, with an endowment of $1,500,000, provides free industrial day and evening classes for both boys and girls; it contains also a lecture-hall, library, and museum. A nautical school for the naval education of its boys is also provided by the state, and occupies the sloop of war *Saratoga*.

There are state normal schools at California, Clarion, East Stroudsburg, Edinboro, Indiana, Mansfield, Millersville, Shippensburg, Slippery Rock, and West Chester. There are numerous city and private normal schools, besides the normal departments in high schools and colleges, and special kindergarten training schools. The higher institutions include the following, of purely collegiate grade: University of Pennsylvania (non-sect). Philadelphia; Lehigh univ.; Haverford coll. (Friends), and Lafayette coll. (Presb.), Easton. The following have preparatory courses: Dickinson coll. (M. E.), Carlisle; Franklin and Marshall coll. (Ref.), Lancaster; Muhlenberg coll. (Luth.), Allentown; Pennsylvania coll. (Luth.), Gettysburg; Washington and Jefferson coll. (Presb.), Washington; Western univ. of Pennsylvania (non-sect.), Allegheny City; Bucknell univ. (Bap.), Lewisburg, and Swarthmore coll. (Friends), Swarthmore. St. Vincent's coll., Beatty; St. Francis college, and the college of the Holy Ghost, all Roman Catholic, have classical courses. The University of Pennsylvania and a few minor institutions have opened some of their courses to women, who have also several separate colleges and schools, prominent among which are Bryn Mawr college, the Ogontz school near Philadelphia, and Methodist and Presbyterian colleges at Pittsburg. There are many excellent schools and colls. for scientific and professional instruction, among others the Wharton school of finance, connected with the University of Pennsylvania, and the Pennsylvania state coll. The state maintains an agricultural coll. in Centre co., endowed with $500,000 and a farm of 300 acres. There are many theological schools; the University of Pennsylvania has departments of law, medicine, dentistry and veterinary medicine. The Jefferson medical coll., the Medico-Chirurgical coll., and the Woman's medical coll., all "regular," are in Philadelphia, as is the Hahnemann medical coll.

(homœopathic). Philadelphia has also dental colls., a college of pharmacy, and post-graduate medical schools; Pittsburg, a coll. of pharmacy. Special instruction in art is given at the Pennsylvania academy of fine arts, the Normal art school, the Woman's Industrial art school, the Spring Garden institute, and the School of Design for Women, Philadelphia. Excellent courses of practical instruction are given at Girard coll., Philadelphia. The Pennsylvania institution for the deaf and dumb, Philadelphia, includes a school of oral instruction. At Edgewood Park is the Western Pennsylvania institution for the deaf and dumb; at Scranton, an oral school for the deaf and dumb; at Philadelphia and Pittsburg, state institutions for the instruction of the blind; at Elwyn, a training school for feeble-minded children, and at Glenn Mills, Huntingdon, Morganza, and Philadelphia, are reform schools.

In 1896 there were 330 libraries of 1,000 volumes and upward each, with an aggregate of 2,964,761 volumes and 355,564 pamphlets. The library of Philadelphia, founded in 1731 by Benjamin Franklin and others, contains 188,600 volumes. There were, in 1896, 1422 publications in the state. The *North American*, founded in 1784, is still in successful operation. It is interesting to note here that the first paper mill in America was built within the present limits of Philadelphia in 1690; also the first type foundry was established in 1796.

Government, etc.—The capital is Harrisburg. The office of gov. or supreme executive was held from 1638 to 1681 by 13 individuals; from the accession of William Penn, 1681, to September, 1776, 26 administrations mark the proprietary government; from 1776 to 1791 6 persons held the office of pres. of the supreme executive council. The state government was organized in 1776. The convention, of which Benjamin Franklin was pres., signed the state constitution Sept. 28, 1776. In 1790 a new constitution, of a more democratic cast, was adopted, which has since undergone repeated alterations. The constitution, as amended in 1838, vested the legislative power in a general assembly, consisting of a senate and house of representatives; the latter, apportioned to the number of taxables, were elected annually, and limited to 100; the former elected for three years, one third annually; their number to be not less than one fourth or more than one third of the number of representatives. An amendment of the constitution, adopted in 1850, makes the judiciary elective, and limits the term of office to 10 and 15 years. Under the provision for amendments to the constitution, in 1864, the right of suffrage was granted to citizens absent in the military service of the state. An amended constitution was adopted in 1873, by a popular vote of 253,744 against 108,594, and went into force Jan. 1, 1874. It limits the senate to 50 members chosen for 4 years, and the house to a changing number, apportioned after each federal census (total 1897, 204), chosen for two years. Sessions biennial, without time limit. The gov. is empowered to convene extra sessions for urgent business, and required to do so in case of a vacancy in the office of a U. S. senator occurring during the recess. The executive department consists of a gov. (salary, $10,000), a lieut.-gov., both elected for four years, and a sec. of internal affairs (three years), an auditor-gen., elected for three years, and a treasurer, elected for two years; an attorney-gen, a sec. of the commonwealth, and a superintendent of public instruction, appointed by the gov., with the consent of two-thirds of the senators, for four years. The gov. is ineligible for two successive terms; he is empowered to commute sentences and grant pardons in their clearly defined limits, and vested, besides the ordinary veto powers, with the prerogative of a partial veto on appropriation bills. The official acts of the gov. are recorded by the sec. of the commonwealth. The department of the sec. of internal affairs embraces a bureau of industrial statistics, and maintains the supervision of corporations, charitable institutions, the agricultural, mining, mineral, timber, and other interests of the state. He must report annually to the general assembly. The judiciary embraces a supreme court, consisting of seven judges, with salary of $8000 each, elected by the people for 21 years, ineligible for re-election, with the judge the oldest in commission as chief-justice, and receiving $8500 salary; the court holds annual sessions at Philadelphia. Harrisburg, Sunbury, and Pittsburg, courts of common pleas, of oyer and terminer, and general jail delivery, of quarter sessions of the peace, magistrates' and orphans' courts. Judges of the supreme court, and those of the common pleas are justices of oyer and terminer and general jail delivery in the respective counties; the latter discharge also the functions of judge of quarter sessions of the peace and of orphans' courts in districts where special provision for them has not been made. Criminal matters of the respective districts belong likewise to their cognizance. There are 51 judicial districts in the state, in each of which the people elect one or more common pleas' judges for 10 years. See Philadelphia. The state contains likewise two districts for holding U. S. courts; for the e. district they are held in Philadelphia; for the w. at Pittsburg, Williamsport, and Erie. The right of suffrage is enjoyed by male citizens not under 21 years of age, who must have been citizens of the U. S. at least one month, residents of the state one year, and of the election district two months before election. The registration of voters is required in this state. New ballot laws based on the Australian system (q. v.) were adopted in 1891. The general election is held annually on the Tuesday next following the first Monday in November. The legal rate of interest is 6 per cent.; the penalty for usury, forfeiture of excess of interest. Married women may hold property separate from their husbands.

The electoral votes have been cast as follows: 1788, Washington 10, Adams 8, scattering 2; 1792, Washington 15, Adams 14, George Clinton 1; 1796, Adams 1, Jefferson 14, Pinckney 2, Burr 13; 1800, Jefferson 6, Adams 7, Burr 8, Pinckney 7;

1804, Jefferson and Clinton, 20; 1808, Madison and Clinton, 20; 1812, Madison and Gerry, 25; 1816, Monroe and Tompkins, 25; 1820, same; 1824, Jackson and Calhoun, 28; 1828, same; 1832, Jackson and Van Buren, 30; 1836, Van Buren and Johnson, 30; 1840, Harrison and Tyler, 30; 1844, Polk and Dallas, 26; 1848, Taylor and Fillmore, 26; 1852, Pierce and King, 27; 1856, Buchanan and Breckenridge, 27; 1860, Lincoln and Hamlin, 27; 1864, Lincoln and Johnson, 26; 1868, Grant and Colfax, 26; 1872, Grant and Wilson, 29; 1876, Hayes and Wheeler, 29; 1880, Garfield and Arthur, 29; 1884, Blaine and Logan, 30; 1888, Harrison and Morton, 30; 1892, Harrison and Reid, 32; 1896, McKinley and Hobart, 32.

PUBLIC CHARITIES are administered by a board of 10 members, appointed by the governor, and a general agent and secretary. The state institutions are the eastern and western penitentiaries, hospitals for the insane at Harrisburg, Danville, Morristown, Warren, and Dixmont; several reform schools; a soldiers' and sailors' home at Erie, and the hospital for miners at Ashland. Institutions not under state control, for the support and care of the defective and delinquent classes, in which state aid is extended to the indigent class, are numerous. There are similar institutions supported by endowments and private charity, receiving occasional state aid. Besides the penitentiaries, the state contains about 70 county jails, a workhouse and a house of correction for first offense prisoners. It numbers also about 60 almshouses, of which about 30 are county and 30 district institutions. The two distinctively reformatory institutions in the state are the House of Refuge, Philadelphia, and the Pennsylvania Reform School at Morganza. There are soldiers' orphans' schools at Chester Springs, Harford, and Uniontown. The Indian training school at Carlisle has met with great success. It was founded by the national government in 1879 to educate the young people of the Indian tribes. The students are chiefly Apaches, Cheyennes, Pueblos, Sioux, and Oneidas, with members of over thirty other tribes. A half day is devoted to the usual grammar school routine, and during the other half the boys are trained to work on farms or in the machine shops, while the girls are taught general housekeeping and economy. The National Guard has an authorized strength of nearly 11,000 officers and men, and an actual strength of over 8,000; and the annual appropriation for the militia exceeds $375,000. The state camp is at Mount Gretna, and division encampments have also been made at Gettysburg. The state arsenal is at Harrisburg, and contains mementos of the Revolutionary and Mexican wars. The naval reserve is composed of companies in Pittsburg and Philadelphia. The total available force of the state in time of war is 812,000.

FINANCES.—The last census report gives the state debt as $4,068,610; county debt, $7,841,484; municipal debt, $54,238,547; school district debt, $4,893,034; total net debt, $71,041,675; net state debt, 1896, $1,748,350.

POPULATION.—1790, 434,373; 1800, 602,365; 1820, 1,047,507; 1840, 1,724,033; 1860, 2,906,215; 1880, 4,282,738; rank of state: 2 in population, 2 in manufactures, and 5 in value agricultural products; population at census, 1890, 5,258,014. There are 67 cos.; for pop. 1890, see Census Tables, Vol. XV. The cities exceeding in population 20,000, in 1890, were Philadelphia, 1,046,964; Pittsburg, 238,617; Allegheny, 105,287; Scranton, 75,215; Reading, 58,661; Erie, 40,634; Harrisburg, 39,385; Wilkesbarre, 37,718; Lancaster, 32,011; Altoona, 30,337; Williamsport, 27,132; Allentown, 25,228; York, 20,793; Chester, 20,226. See histories by Proud (Philadelphia, 1797); and Cornell (New York, 1879); Watson's *Annals of Philadelphia and Pennsylvania* (Philadelphia, 1857).

PENNSYLVANIA DUTCH, the language of settlers of a considerable part of Pennsylvania, which is formed, not as might be supposed, by a blending of tongues of people of various nationalities meeting there, but which is the dialect of a people of south Germany, found near each other in that region, mainly Rhenish, Bavarians, Swiss, Alsacians, and Germans, to which is added a modicum of English words, taken often without alteration of form. The late H. Harbaugh, D.D., wrote a volume of fine poems, published in 1870, which exhibit the peculiarities of this dialect, as does also Haldemann's *Pennsylvania Dutch,* 1872.

PENNSYLVANIA, UNIVERSITY OF, in Philadelphia, was chartered in 1755 and is the sixth in the order of succession of American colleges. It is the outgrowth and successor of the college of Philadelphia, which was founded chiefly through the influence of Dr. Benjamin Franklin and Dr. William Smith. The latter was the first provost, and is conspicuous in history as having established in 1757 the curriculum of study which was adopted substantially by the colleges of later foundation. The medical department was established in 1765; that of law in 1789; the auxiliary faculty of medicine in 1865; the Towne scientific school in 1872; the dental school in 1878. The university embraces 12 departments: 1. The department of arts; 2. The Towne scientific school; 3 and 4. Two departments of medicine; 5. The department of law; 6. The school of music; 7. The school of dentistry; 8. The department of philosophy; 9. The department of veterinary medicine; 10. The Wharton school of finance; 11. The department of biology; 12. The department of physical culture. The University, occupying a large area in West Philadelphia, has separate and commodious buildings for many of its departments. The building for the departments of arts and for the Towne scientific school is one of the largest and most conveniently arranged college buildings in the country. The trustees have lately introduced into the official curriculum of medical study the methods which have long been used in European schools, and which, in all other departments of science, have given vitality and practical utility to the older didactic systems. The department of law has also been lately reorganized. The school of dentistry combines thorough practical instruction in mechanical and operative dentistry.

with such medical studies as are considered essential to the well educated dentist. Great additions have been recently made to the libraries of the university. Besides the old library of the university, and those libraries which are designed for the use of students in chemistry and engineering, there is the Colwell library, composed of a very complete collection of books relating to social and political science, which has been augmented by the bequest of the statistical and economical library of the late Henry C. Carey. The extensive and valuable classical library of the late Professor Allen has been presented to the university. A very choice collection of books, intended to illustrate the instruction in history and English literature, has also been added; and, lastly, a library selected with great care, and designed to aid in the study of the English language, and of the early English literature, has been procured. The extensive libraries of the literary and the scientific societies of the university are also open to their members. The design of the scientific school is to give a thorough technical and professional training to those who propose to engage in the following, among other pursuits, viz: in chemistry, with its manifold applications to the industrial arts; in metallurgy and assaying; in mineralogy, geology and mining; in civil, dynamical or mechanical, and mining engineering; in mechanical drawing and architecture; and in studies preparatory to medical study. The cabinets and apparatus are of the first order. The chemical department contains over 10,000 specimens of minerals, representing the most important forms and varieties of nearly every established species. The metallurgical and assay laboratories are furnished with the requisite furnaces, also with diagrams and models, representing many of the most important forms of furnaces and machinery, and a spectroscope, especially constructed for observations in the production of Bessemer steel. The geological department has a collection of American fossils (exclusive of the vertebrates), arranged chronologically, in two suites, the first lithological, the second paleontological, for the purpose of showing not only the characteristic genera and species, but their changes in relation to the sediments containing them. There are also suites of European fossils and collections of American coals and iron ores. In the department of physical engineering, the cabinet contains a very full collection of models, charts, and apparatus for fully illustrating the subject. The provisions for medical and surgical instruction and demonstration are very complete. The law department is thoroughly organized and effective. Number of professors, demonstrators, and instructors (1890), 174. Students—department of arts, 121; scientific, 254; music, 6; medicine, 469; law, 109; dentistry, 112; whole number, 1,022. Provost, William Pepper, M.D., LL.D.

PENNY, a British coin and money of account. After the Sceattæ (q.v.) it is the most ancient of the English coins, and was the only one generally current among the Anglo-Saxons. The name is evidently the same as the German *pfennig*, and both words seem to be intimately connected with the old German *pfant*, a pledge, and the Latin *pendo*, to weigh or to pay. Both in Britain and on the continent the word was anciently used for money in general, hence we have such phrases as "he has got his *penny-worth*," i.e., he has got value for his money, etc. The penny is first mentioned in the laws of Ina, king of the West Saxons, about the close of the 7th c. It was at this time a silver coin, and weighed about 22½ troy grains, being thus about $\frac{1}{240}$th of the Saxon pound weight. This relation to the pound weight is evidently derived from the usage of the early Franks, who retained the Roman division of the *libra* into 20 *solidi*, and the *solidus* into 12 *denarii* (the denarius being thus the 240th part of the libra or pound. See Mark. Half-pence and farthings were not coined in England till the time of Edward I., but the practice previously prevailed of so deeply indenting the penny with a cross mark that the coin could be easily broken into two or four parts as required. Silver farthings ceased to be coined under Edward VI., and silver half-pennies under the commonwealth. By this time the penny had steadily decreased in weight; it was 18 grains under Edward III., 15 and 12 under Edward IV., 8 under Edward VI., and under Elizabeth it was finally fixed at $7\frac{2}{31}$ grains, or $\frac{1}{62}$ of an ounce of silver, a value to which the subsequent copper pennies, which till 1860 were the circulating medium, closely approximated. In 1672 an authorized copper coinage was established, and half-pence and farthings were struck in copper. The penny was not introduced till 1797, and at the same period the coinage of twopenny pieces was begun; but these latter, being found unsuitable, were withdrawn. The penny of the present bronze coinage is of only about half the value of the old copper penny. The German *pfennig* was also originally a silver coin, bearing the same relation to the German pound of silver as the English penny to its pound. And in the 12th c. it was made so broad, in imitation of the Byzantine coins, that it would no longer bear to be struck with a die on each side as before, but was struck on one side only. In the beginning of the 14th c. the mark of silver was anew divided into 60 parts or coins, which, to distinguish them from the old coins, were called *grossi denarii*, whence the term *groschen*. In the modern money system of Germany, the pfennig is a nickel coin, the hundredth of the mark, the latter being equal to a shilling.

PENN YAN, village and co. seat of Yates co., N. Y.; on Lake Kueka and the Fall Brook and the Northern Central railroads; 43 miles n. of Elmira. It derives excellent power for manufacturing from the lake, is in a noted grape-growing region, and has large general agricultural and fruit interests. It was incorporated in 1833, and has regular steamboat communication with the head of the lake at Hammondsport, national

and state banks, public library, and academy, and several newspapers and churches. Pop. '90, 4,254.

PENNYPACKER, GALUSHA, b. Penn., 1844; on the breaking out of the civil war he enlisted as a private and rapidly rose in rank, becoming colonel in 1864, before which he had been engaged in Florida, and at Charleston harbor and Drury's bluffs, where he was three times wounded. He commanded a regiment at James river and the siege of Petersburg, and a brigade at Port Harrison and Fort Fisher, where he was again severely wounded and for his conduct was promoted brig.-gen. In 1866 he was made a col. in the regular army with the brevet of maj.-gen. His wounds compelled his retirement, 1883.

PENNYROY'AL, a species of mint (q.v.). The name pennyroyal is given in North America to a small plant, *Hedeosma pulegioides*, allied to the mints, and having, like them, a pleasant aromatic smell, and a warm pungent taste; which is much in use in domestic medicine, in the form of a warm infusion, to promote perspiration and as an emmenagogue.

PENNY WEDDINGS, or PENNY BRIDALS, was the name given to festive marriage ceremonials in Scotland, at which the invited guests made contributions in money (seldom more than 1s. each), to pay the general expenses, and leave over a small sum, which would assist the newly married pair in furnishing their dwelling. This practice, now disused, was prevalent in the 17th c.; and, as leading to "profane minstrelsing and promiscuous dancing," was denounced by an act of the general assembly of the Kirk, 1645, as well as by numerous acts of presbyteries and kirk sessions about the same period.

PENOB'SCOT, a river of Maine, rises near the center of the state by two branches, from a chain of lakes extending north-westerly; and after a s. by w. course of 135 m. from the junction, or 300 in all, empties into Penobscot bay, a broad and sheltered opening into the Atlantic ocean, 20 m. wide, with several large islands. Its chief towns are Belfast, at its mouth; Bangor, 50 m. above, where falls supply power to saw-mills and factories; Castine, and Bucksport. It is navigable to Bangor, where there is a tide of 20 ft. The chief trade is pine timber.

PENOBSCOT, a county in central Maine; drained by the Penobscot, Mattawamkeag, Kenduskeag, Piscataquis, and Leboois rivers; intersected by the Bangor and Aroostook, the Maine Central and Grand Trunk railroads; 3332 sq. m.; pop. '90, 72,865, chiefly of American birth. The surface is rugged and uneven, but fertile in the southern part. Lumber is the chief article of export, and between $4,000,000 and $5,000,000 worth are annually handled. Wool, potatoes, oats, hay, and dairy products are the staples. There are nearly 1000 manufactories, planing and saw mills, etc. Co. seat, Bangor.

PENOBSCOTS AND PASSAMAQUODDIES, Indians in Maine belonging to the Abenaqui branch of the Algonquins. In reward for their adherence to the colonial side in the revolution, Massachusetts ceded them a reservation on both banks of the Penobscot. The Passamaquoddies live along the Schoodic lakes and the w. shore of Passamaquoddy bay, and number about 500. The Penobscots, whose number is about the same, are mostly found on Indian island, opposite Oldtown. They elect a governor and lieutenant-governor. Both tribes belong to the Roman Catholic church.

PENRITH, a market t. of Cumberland, in a picturesque and fertile valley, with rich and striking scenery in the vicinity, stands on the Carlisle and Lancaster railway, 17 m. s.s.e. of Carlisle. In the parish churchyard is a monument of great antiquity, formed of two pyramidal stones about 12 ft. high, and known as the "Giant's Grave." The town contains an ancient free grammar-school, and other educational institutions. Pop. '91, 12,329.

PENRYN, a municipal and parliamentary borough and market t. of England, in the county of Cornwall, in a warm, sheltered, and richly productive valley, on the Plymouth and Falmouth railway, 2 m. w.n.w. of Falmouth. It stands on a low hill projecting eastward into Falmouth harbor. Trade is carried on to some extent with the mining district of Redruth, and there are several quarries in the vicinity, from which the famous Penryn granite—the material of which Waterloo Bridge, the Chatham docks, and a great number of other important public works are constructed—is obtained; 20,000 tons of granite have been exported in the year, but the quantity varies much. Pop. '91, of municipal borough, 4247. Together with Falmouth, it forms a parliamentary borough, which returns two members to parliament.

PENSACO'LA, city, port of entry, and co. seat Escambia co., Fla.; on Pensacola bay and the Louisville and Nashville and the Pensacola, Alabama, and Tennessee railroads; 7 miles from the gulf of Mexico. Its location made it an important point in early days, and its commodious, deep, and landlocked harbor led the U. S. government to establish a large navy yard there and to erect forts Barrancas, McRae, and Pickens for its protection. While in the possession of Spain the harbor was defended by San Miguel and San Bernardo fortresses. The city passed into the possession of the British in 1814 and into that of the United States in 1821. In the early part of 1861 the navy yard was surrendered to the state authorities, but the federal government recovered it in the following

year. The city has gas and electric lights, an abundance of good water, national banks, orphans' and widows' homes, daily and weekly newspapers, and about 10 churches. The principal industries are manufacturing and the shipment of lumber, coal, iron, cotton, and naval stores, the exports exceeding $6,000,000 per annum in value. Pop. '90, 11,750.

PENSIONARY, GRAND, OF HOLLAND. See GRAND PENSIONARY.

PENSIONS and PENSIONERS. The policy of the United States up to the year 1869 had been to confine the bestowment of pensions upon officers and privates who had served either in the army or navy during the earlier wars in which the country was engaged, or who had been wounded or otherwise disabled in active service during the more recent wars ; or to the widows, children, and other dependent relatives of the slain. The only exception to this rule had been in the case of a few private acts granting pensions to individuals for some public service or some act of signal heroism. But in that year a bill was passed which provided, among other things, that any judge of the U. S. courts who resigned his commission after 10 years' service, or longer, should continue during the remainder of his life to receive his full salary. Since that time pensions have been conferred on ex-presidents' widows (Mrs. Lincoln, Mrs. Garfield, Mrs. Polk, and Mrs. Tyler), on members of the life-saving department, on employés in the quartermaster's and pay-master's departments, etc. Military pensions may be said to date from the first year of the Revolution. In 1776 it was resolved that all officers who should continue in the service until the end of the war should receive half pay for 7 years after peace was established. In 1780 the provisions of this law were extended to the widows and orphans of those who died in the service. The half pay for 7 years was next extended to half pay for life, and subsequently commuted to full pay for 5 years. Between 1806 and 1818 the principle was established that all persons, whether officers or privates, who had been disabled in the course of either military or naval service should be provided for at the public expense. In 1818 pensions were granted to all the survivors of the Revolutionary war who for any reason stood in need of pecuniary assistance ; and subsequent legislation extended the provisions of the pension laws to other wars than the Revolution, so that they included military service wherever rendered. Since the civil war numerous acts have been passed for the relief of those who suffered, either directly or indirectly, while fighting for the union, and of the dependent relatives of the fallen. The provisions of the laws which determine the various classes of these beneficiaries, the amounts of their respective pensions, and the manner of making applications for the same, are too minute and intricate to be entered into here. A pamphlet containing the laws, with forms and instructions, is furnished free of charge by the commissioners of P. or the laws themselves may be found in the *U. S. Revised Statutes*, sections 4692–4791.

The recent growth of the pension list of the United States has been very great. In 1861 there were 8636 names upon the rolls receiving $1,072,461 annually. In 1865, 85,986 pensioners drew $8,525,153 ; in 1870, 198,686 persons drew $27,780,811 ; in 1875, 234,821 drew $29,683,116 ; in 1880, 250,802 drew $57,240,540 ; in 1885, 345,125 drew $65,693,706 ; in 1890, 537,944 persons drew $106,493,890. The disbursements in pensions for the year ending June 30th, 1891 was $124,415,951. This is $43,436,218 more than the cost of the entire military establishment of Germany for the same year. The total disbursements for pensions from 1861 to 1891 amounted to $1,158,712,303.36. In 1890, there were filed 105,044 applications for pensions, of which 66,637 were allowed. Of these 50,393 were made by surviving soldiers themselves, the rest by widows, etc. Some 1900 applications were on account of services in the Mexican War. In 1890, there were on the rolls the names of 23 widows of Revolutionary soldiers. There are 18 pension agencies in the United States, located at the following cities : Augusta (Me.), Boston, Buffalo, Chicago, Columbus (O.), Concord (N. H.), Des Moines, Detroit, Indianapolis, Knoxville (Tenn.), Louisville, Milwaukee, New York, Philadelphia, Pittsburgh, San Francisco, Topeka, Washington.

PENTADES'MA, a genus of trees of the natural order *guttiferæ*, to which belongs the BUTTER-AND-TALLOW TREE of Sierra Leone, *P. butyracea.* It is a tree 60 ft. high, and produces a conical fruit of the size of a very large pear, the pulp of which abounds in a yellow oily substance, with a strong flavor, somewhat resembling that of turpentine, yet much used by the natives as an article of food.

PENTAGON is a plane geometrical figure of five sides. When the sides are equal, the figure is called a regular pentagon.

PENTASTYLE, a building with a portico of five columns.

PENTATEUCH (Gr. fivefold book), a name given by Greek translators to the five books ascribed to Moses, which are in Hebrew called collectively *Torah* (law), by way of eminence, or *Chamisha Chumshe Torah* (five-fifths of the Torah). *Law* is also the general name by which the work or portions of it are referred to and quoted (the words "of Moses" or "of the Lord" being added occasionally) both in the Old and New Testament.

The division into five portions (further divided into 50, 40, 27, 36, 34 chapters, or 12, 11, 10, 10, 11 Parshioth or Sidras respectively, by the Masoretes) is, if not original, at

all events of a very remote date, and certainly anterior to the Septuagint. Genesis, Leviticus, and Deuteronomy, the first, third, and fifth books, form clearly defined and internally complete parts of the work as a whole, and thus, also, fix the limits of the intermediate second (Exodus) and the commencement of the concluding fifth (Deuteronomy). The chief aim of the Pentateuch being to give a description of the origin and history of the Hebrew people up to the conquest of Canaan, together with the theocracy founded among them, the center is formed by the person of Moses himself, the regenerator and lawgiver of the nation. Genesis, beginning with the history of the creation and antediluvian genealogy from Adam to Noah, in rapid outlines, sketches the propagation of the various tribes that descended from the one man who was saved in the deluge, but dwells with special emphasis upon Shem, from whom sprang, in the tenth generation, Abraham, the progenitor of the "people of the covenant." The salient events in the lives of his descendants, the patriarchs, are minutely described; and a fitting close is found in the benediction of Jacob, who, as it were, reinaugurates and confirms all his twelve sons in the covenant made between Abraham and God. Exodus, treating of the liberation of the people from Egypt; their wanderings in the desert; the promulgation of the law, by which they became emphatically the "holy nation" and the "people of the Lord;" and the erection of a visible sanctuary—may be regarded as the nucleus of the work; while Leviticus, the following book, fittingly enters into the details of the legislation and the mode of worship; especially the prescriptions concerning sacrifices, festivals, ceremonial purity, and the duties of the priests, with but little of history. The historical thread is taken up again in Numbers, the fourth book, which, also, side by side with the relation of the events between the Sinaitic period and the beginning of the fortieth year after the Exodus, contains many laws explanatory of, or complementary to, those of the former books, together with such as new circumstances had called into existence. A brief recapitulation of the preceding portions; Moses's most impressive and reiterated exhortations to keep that law, which was now completed and solemnly transmitted to the Levites; and the death of the legislator himself—form the chief contents of the fifth book, or Deuteronomy. Thus, the theocratic plan of the work is carried through from beginning to end, coming out more prominently in the three intermediate books, but never lost sight of entirely. Nothing is dwelt or even touched upon save that which in some way illustrates either the relation of God to the people, or of the people to God; the political, civil, and domestic laws themselves, being enumerated only as bearing upon the main aim and object of the work.

The special books being treated separately under their respective heads, we have here only to consider some questions relating to the work as a whole, and principally that of its authorship and history, as far as these points have not been touched upon already under Genesis. Tradition, as embodied in the earliest historical records, mentions Moses as the writer of the complete Pentateuch, such as it is before us: with the exception of a few verses, describing the last moments of the law-giver, etc., which were ascribed to Joshua. This tradition has for many a long century been almost universally adhered to. Not that there have not at different periods suspicions been raised respecting this "authenticity." The pseudo-Clementines, for instance, assumed that the law, orally delivered by Moses to the elders, had, before and after its being committed to writing, undergone innumerable changes, nay, corruptions; among these the too personal and human conceptions of God, and the unworthy traits recorded of the patriarchs. Jerome expresses himself in a somewhat doubtful manner on the relation of Ezra as the "redactor," or rather "restorer," of the Pentateuch. Aben Ezra boldly calls several passages later interpolations, and speaks of others still more poignantly as a *ssod*, or a "mystery," i.e., as containing difficulties not to be cleared away in consonance with the common belief, which he, however, was too pious wantonly to disturb. Other voices, vaguely lifted up by more or less competent scholars, remained unheard. It was not until long after the reformation, at the dawn of the exegetical and critical modern age, that the question whether this codex was the work of one man, or even of one age, and what share, if any, Moses had in its composition, began to be discussed seriously and on scientific grounds. Hobbes held that the Pentateuch was rather a work on, than by Moses. Spinoza came to the conclusion that it was to Ezra that we were indebted for the book in its present shape and that it embodies certain genuine portions, collected at a late period, together with a vast amount of later material, added at various periods subsequent to the time of the supposed author. Vitringa, Le Clerc (Clericus), Rich, Simon, and others, followed, resuming and enlarging the discussion chiefly respecting the difficulties which presented themselves in the accounts of the creation, and the like, contained in Genesis. The next, and indeed the most important step—because the one which at once removed the question from the field of hazy and timid speculations to that scientific basis upon which it still rests, was taken by Astruc, who, from the marked difference of the divine names used in Genesis and the beginning of Exodus—noticed in the Talmud and the Fathers of the Church—came to the conclusion that these books had been worked up from different original documents, which he called Jehovistic and Elohistic respectively. See article Genesis, where the development of this speculation is described. At the present stage of the investigation, the view very generally adopted is the "complementary theory," which assumes, with certainty, two or more authors—Jehovists and Elohists—for the whole of the first four books, at least; the fifth being by

some (Delitzsch, Schulz, Kurz, etc.) still ascribed chiefly to Moses's own hand. Only a small apologetic school, of which Hengstenberg long was spokesman, still upholds the entire integrity and authenticity of the work, pronouncing Moses its sole author. The contemporary discussions on these points, which, up to within a very recent period, were chiefly confined to Germany, have now also found their way into England. The impulse to the controversy in this country was principally given by Dr. Davidson, the "essayists and reviewers," and bishop Colenso, all of whom, on the basis of these German investigations, raised some new points. Innumerable replies, by more or less competent champions, have been issued; but as yet, so far from either of the combatants having declared themselves convinced by the arguments from the other side, the controversy elicits new publications uninterruptedly.

While endeavoring to trace, in the briefest of outlines, some of the chief objections raised against the Mosaic authorship and the replies given thereunto, we must remind the reader that ours is only the task of epitomizers, as it were, and that the very nature of our task precludes us from giving any opinion whatsoever about the superior force of the arguments on either side.

A work, alleged to be the production of one man, it is urged, first of all ought to contain neither unnecessary repetitions of considerable length, nor contradictions, nor anachronisms. There ought to be a plan and a unity. Yet, there can be no doubt, they say, about the fragmentary character of the Pentateuch. Many portions, evidently complete in themselves, are strung together without the slightest logical sequence, nay, in an unchronological order. As to repetitions and contradictions, there is, to begin with, the very history of the creation, which occurs twice in the first chapters of Genesis, is each time given differently, and in each account the divine name is consistently mentioned in a different way. The same is to be said with regard to the account of the deluge, and several incidents in the lives of the patriarchs; the important conversation between God and Moses respecting Aaron (Exod. iv. 10–16, and vi. 9); the descriptions of the tabernacle; the priestly vestments; the story of the manna as given in Exodus and Numbers; the account of the appointment of the council of the 70 elders in the same books; etc. Again, the work itself sometimes seems to indicate an author who is not the legislator himself, such as the phrase of Moses being the humblest of men; the account of his own death; the passage in Genesis "before there reigned any king over the children of Israel" (xxxvi. 31); the occurrence of the name of the city of Dan (Gen. xiv. 14, Deut. xxxiv.1), so called only after the conquest by that tribe. In Numb. xxxii. 34, again, we have an enumeration of a certain number of towns and villages built by the tribes of Gad and Reuben—an event which could not have happened during Moses's lifetime; further, the frequent occurrence of the formula "unto this day" (e.g., Deut. x. 8, where the author speaks of the institution of the Levites as being still in force "up to this day"), etc. It is contended, also, that the language of the Pentateuch varies very little from that of the last prophets, and that it can hardly be assumed that 1000 years should have made no perceptible difference in the idiom; more particularly has Deuteronomy been supposed to bear a striking resemblance, in style and language, to Jeremiah. The Pentateuch is further said to contain many facts palpably contradictory to natural laws, as they are established in the experience of the whole historical human race, and systematized by science.

Of the many ways to get rid of these and similar—old and new—exceptions, the most generally adopted is that which we mentioned as the method of "interpolation," by which the apologetic school strikes out some 50 or more passages, as not belonging to the original work, but having crept in, by way of commentary, note, or explanation, in post-Mosaic times—the body of the work being thus saved, so to say, by a most extensive amputation. As to the argument from the language, it is said that the Pentateuch, being *the* divine book, by way of eminence, and embodying the very phrases (to the letter) made use of by the Almighty, must needs have served as a model for the next 1000 years, and priests and Levites, the teachers of the people, were enjoined constantly to study and read it: hence the small difference in the later writers. Arabic and Syriac, it is argued, did likewise not change essentially for many centuries—an assertion, however, which only holds good if "many" is taken in a very vague sense indeed. That Deuteronomy differs in style and manner, is verbose, etc., is explained by Moses's advanced age. On the other hand, events which are not in harmony with the "natural laws" are accepted by the orthodox simply and literally as "miracles," while "conservative" rationalists of the school of Eichhorn, Rosenmüller, and others, who stand by the authenticity of the Pentateuch, have been at great pains to find some kind of poetical interpretation for them.

Some of the recent attacks on the authenticity are chiefly founded upon arithmetical grounds. The numbers of the people, their cattle, and the like, at various periods, do not seem to conform to the laws of natural increase, or even to the geometrical limits within which they were at times stated to have been confined. Among the direct proofs, however, proffered by the defenders of the authenticity, the following chiefly deserve attention. Deuteronomy, it is averred, can only be the work of Moses. He speaks in it to the men whom he has led for many years, as one who has lived through all the events himself. There is no possibility of any one imitating the local coloring in such a manner. If, then, Deuteronomy must be allowed to be the work of Moses, the three preced-

ing books, to the contents of which frequent allusion is made, must equally be supposed to be finally redacted, if not written, by the same hand; and it further follows naturally, that the introduction to these books, which is Genesis, must have emanated from it. Again, any one writing after Moses, could not possibly have possessed the extraordinarily correct knowledge of contemporary Egypt and Arabia, which appears throughout the Pentateuch. A writer who might be supposed to have acquired it by dint of study of antiquities, must, it is said, have betrayed himself on every page by inaccuracies and anachronisms. Nineveh is in Genesis a city of as yet little importance; while Resen, of which no trace is to be found in any other part of the Bible, is the great metropolis of Assyria of the time. Tyre, great in the days of David, and mentioned already in Joshua, is not to be met with in the Pentateuch, where a later writer would certainly have spoken of it in connection with Sidon. The Canaanite gods and altars are often spoken of; never their temples, of which yet we read in Joshua. Why, then, should that very ancient author, to whom must needs be traced the Pentateuch, not be Moses himself, rather than some contemporary of his? The fragmentary, abrupt, and, as it were, confused character of the work, the apologists further urge, so far from testifying against Moses, confirm the tradition of his authorship. Would not a later historian have worked the mixed mass of historical, geographical, legal, and personal material into a methodical and systematic whole? Who else could have imparted to the book the impress of a diary, so to say, but the man who was in the midst of the events, jotting down all the items important either in his own individual or the national career? And who but one standing in its very center could depict with such glowing colors the life that moved around him?—But a further direct argument for the authenticity is found by them in the very item of the language of the Pentateuch. True, they say, it resembles as much as can be that of the later books, because, as we said before, it remained the classical language for all later generations; but, on the other hand, it offers certain peculiarities—such as the use of a common pronoun of the third person singular for both the masculine and feminine genders; the same term for boy and girl; and the like archaisms—all of which distinctly prove it to be a work of a very much older date. The existence of an ancient Mosaic code of laws would further appear proved beyond any doubt by the constant recurrence of quotations from "the law of Jehovah" or "the law of Moses" throughout the other books of the Old Testament from Joshua to Hosea. Had there in reality been no such code in existence, the authors of the different biblical works could not possibly have so unanimously spoken of it without betraying a conscious forgery somewhere. That Ezra should have been the author, or, at all events, the refounder of the Pentateuch, is equally improbable, on account of the spirit, tone, language, and all those smaller peculiarities of which mention has been made; and he would, on the other hand, never have been able so skillfully to avoid his own individual manner and style, as it appears in his own book. The Samaritan Pentateuch, it is further said, which, with a very few characteristic alterations, is an accurate transcript of our Pentateuch, would have been an utter impossibility, considering the hostile relations between the Samaritans and the Jews, if it had not been well known as a genuine document before the division of the empire. That Hilkiah, who is said to have *found* the Book of the Law in the temple in the days of Josiah (2 Kings xxii.; 2 Chron. xxxiv.) should have been its real author—an opinion first advanced by De Wette—would imply a complicity in the forgery not only on the part of Jeremiah, Huldah, and the elders, but almost of the whole people, among whom, on the contrary, there certainly seems to have been living a very vivid tradition of the former existence of the book or some of its portions at least. Moreover, had it been first written in those days, there surely would have been introduced some kind of prophetical allusion to the royal house of David, or, at all events, a pedigree and origin differing from the incestuous one given in Gen. xxxviii. Deuteronomy would altogether have changed its language about royalty (xvii. 15–20) very considerably; and Joseph's would not have stood out so prominently as a favored tribe. The alleged difficulties respecting the numbers are explained away more or less convincingly—in the most difficult cases, by miraculous interference. Corruptions, interpolations, and the many fates that befall ancient documents, are allowed to have crept in, in some places; although this argument is given up by those who hold that a special providence watched over the divine work. In all other respects, they hold these books are exactly as they were written by Moses under direct "inspiration."—Thus far, in swiftest outlines, the pros and contras most commonly adduced, and worthy of some consideration.

A few rationalistic critics, however, have gone so far as to deny the very possibility of Moses having given the laws contained in the Pentateuch, chiefly founding their objections upon the ground that he was not likely to have been versed in the art of writing to an extent which the composition of these laws would presuppose. Egyptian characters, with which he might have been familiar, could not have been used for Hebrew composition; and the Hebrews themselves, uncultivated as they were, did not possess any characters of their own. There has only, in reply to these objections, that fact to be stated, that a soberer criticism of more recent date has found itself obliged, in deference to certain paleographical and other scientific truths, to give up most of these points, or, at all events, to found no such sweeping condemnation upon those which still remain. On the contrary, whichever of the hypotheses enumerated at the beginning is assumed, the groundwork of the legislation is traced back, by almost unanimous con-

sent, to the historical person of Moses, who is no longer the mythical demigod of barbarous hordes, but a man. The final redaction of these laws—of which many of later date are found to be wholly inconsistent with the earlier corresponding laws—as of the whole of the Pentateuch, is almost as unanimously placed in ages long after him.

In the contemporary "moderate" school in England, so far as we have been able to glean from their writings, the following seems to be the prevalent opinion on the point of the Mosaic authorship. It is allowed that Moses did not write the whole of the Pentateuch, but portions of Exodus, Leviticus, and Numbers, and the whole of Deuteronomy, with the exception of the account of his death, and such portions as palpably show an author who points to the imminent dissolution of the empire. That even the fundamental law (Decalogue) should be found in two varying versions, they hold, strengthens rather the assumption of their genuine Mosaic authorship in some original shape. The later editor, finding two different recensions made by contemporaries, or in subsequent ages, embodied them both, on account of their paramount importance, literally. Genesis was worked up from ancient documents, composed by various writers, living at various "prehistoric" periods, either by Moses himself, or under his supervision, by some of the elders. The first redaction of the five books as a whole took place after the conquest of Canaan, through Joshua and the elders; the second and final redaction, however, in which it received its present shape, is to be dated from the time of Ezra, after the return from exile.

The majority of continental modern critics of the more moderate stamp—who repudiate the notion of their belonging to the advanced rationalistic party—hold opinions of a very different kind; and since they have found professed partisans in England, the foremost of whom is Dr. Davidson, we will make use of his own words (*Introduction to the Old Testament*): "There is little external evidence for the Mosaic authorship; and what little there is, does not stand the test of criticism. The succeeding writers of the Old Testament do not confirm it. The venerable authority of Christ himself has no proper bearing on the question. The objections derived from internal structure are conclusive against the Mosaic authorship. Various contradictions are irreconcilable. The traces of a later date are convincing. The narratives of the Pentateuch are usually trustworthy, though partly mythical and legendary. The miracles recorded were the exaggerations of a later age. The voice of God cannot, without profanity, be said to have externally uttered all the precepts attributed to him. Moses's hand laid the foundation of the edifice of God's word, which has grown into the proportions in which we now possess it; but he was not the first writer who penned parts of the national legends and history. He was emphatically a *lawgiver*, not a historian, a grand spiritual *actor* in the life-drama of the Israelites, who founded their theocratic constitution under the direct guidance of the Supreme."

A few words must be added respecting the use of the Pentateuch. According to Deut. xxxi. 24 seqq., it was preserved in the ark of the covenant. Every seventh year it had to be read to the people in public; and probably the schools of prophets, instituted at the time of Samuel, propagated its use by copies. Moreover, certain priestly, sanitary, and other laws required constant reference to it, so that certain portions of it seem to have been widely in use at an early period. Every synagogue is, according to the tradititional law, to possess a roll of the torah, written on parchment, and under certain strictly-insisted-upon regulations, out of which roll certain portions are read on Sabbath and feast-days; and, according to the ancient custom in Palestine, when Monday and Thursday were the market-days—when the country-people came to town and the judges sat—also on those days. A smaller portion (parasha) is read on these and on the afternoon service of the Sabbath than on the Sabbath morning service, when a whole sidra is read, or rather chanted, accorded to the *Neginah*, which is note and accent at the same time. The Samaritans have, of all biblical books, only adopted the Pentateuch, with slight variations (see SAMARITAN PENTATEUCH), their book of Joshua being a very different work from ours; and certain very recent accounts of their possessing also other adaptations of our biblical books, require confirmation. For the different translations of the Pentateuch, ancient and modern, see BIBLE. The first printed edition of the Pentateuch dates Bologna, 1482, fol. The name of commentators and writers on the whole of the Pentateuch, both in and out of the church, is legion. We mention among the foremost, besides the church fathers (Augustine, Jerome, Ephraim, Syrus, etc.) and the mediæval Jewish commentators (Raspi, D. Kimchi, Aben Ezra), Calvin, Luther, Grotius, Père Simon, Le Clerc, Michaelis, Eichhorn, Jahn, De Wette, Keil, Hävernick, Bleek, Hengstenberg, Ranke, Kurtz, Stähelin, Ewald, Bertheau, Colenso, Graves, Stuart, Bush, etc.

PENTECOST (Gr. *pentecosté*, fiftieth) was the name given to the feast among the Jews, held on the fiftieth day after the passover, in celebration of the "ingathering," and in thanksgiving for the harvest. See FESTIVALS. From the Jewish use it was introduced into the Christian, and with special solemnity, as being the day of the descent of the Holy Ghost on the apostles, and of the first solemn preaching of the Christian religion. From early times, pentecost has been regarded as one of the great festivals of the Christian year, and it was chosen as one of the times for the solemn administration of baptism; and the English name of the festival, *Whit-Sunday*, is derived from the *white* robes in which the newly-baptized were clad. It is regarded as specially sacred to the Third

person of the blessed Trinity, to whose honor the services of the day are directly addressed. Many curious usages were anciently connected with the celebration. The dove, being held as an emblem of the Holy Ghost in some churches, a figure of a dove, suspended by a cord from the ceiling, was lowered so as to alight on the high altar during the service. In others, figures of cloven tongues, or red rose-leaves were similarly introduced. The latter practice is said to be still retained at Messina, but in general these scenical representations have been discontinued. In some places, however, in the east as well as in the west, the practice prevails of decorating the churches with evergreens and flowers, as is done in England at Christmas. The whole time intervening between easter and pentecost is celebrated in the Roman Catholic church with special solemnity, and with some peculiar usages, and of this something is retained in the church of England.

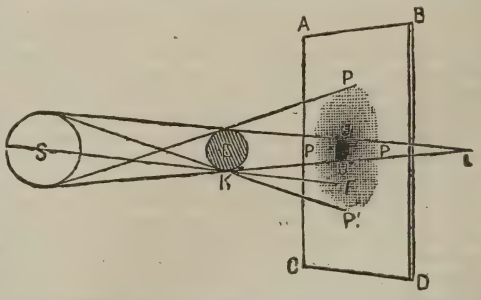
PENTHOUSE, a projection forming an open roof or shed, protecting a doorway, gate, window, etc.

PENTHIÉVRE, Pierre Philippe Jean Marie d'Orléans, Duc de, b. France, 1845 son of the prince de Joinville. He studied at Edinburgh, and in 1861 entered the U. S. naval academy. He was commissioned a midshipman in 1863, and a lieut. in 1864. Leaving the U. S. service for political causes, he entered that of Portugal, in which he remained 2 years. He is now an officer in the French navy.

PENTLAND FIRTH, a channel or strait between the Atlantic and German oceans separating the mainland of Scotland from the Orkney islands. It is 14 m. long, and from 6 to 8 m. wide. About a mile w. of Duncansby head is a ferry station, whence boats cross to Burwick, in the island of south Ronaldshay, a distance of 7 miles. The Pentland skerries, 5 m. n.e. of Duncansby head, consist of two islets, and of several contiguous rocks. On the larger of the islets is a light-house with two lights, one of which is visible for 19 m., and the other for 18 m. The lat. of the light-house is 58° 41′ n., long. 2° 55′ west. Off the coast of Caithness, and separated from it by a channel called the inner sound (about 2 m. in width), is the island of Stroma; and 3 m. n.n.e. of Stroma is the islet of Swona, one of the Orkneys. On the n. side of Stroma is the small vortex or whirlpool of Swalchie, and w. of it are the breakers called the "men of Mey," which are supposed to be produced by a current setting strongly on a concealed reef. The navigation of the Pentland firth is more dangerous than that of any other portion of the Scottish seas. A current setting from w. to e. flows through the firth with a velocity of from 6 to 10 m. an hour, and causes numerous eddies and whirlpools. It is estimated that about 4,000 vessels with cargoes pass through the firth annually.

PENTLAND HILLS, in the lowlands of Scotland, extend n.e. from the border of Lanarkshire to the center of the county of Edinburgh, and to within 4 m. of the city of that name. The mean height is upwards of 1000 ft.; the highest summit, Scold Law, in Edinburghshire, has an elevation of 1898 feet.

PENUM'BRA. When the shadow of an opaque object is thrown upon a surface at some little distance by a light of considerable apparent size, it is observed that the shadow is divided into two portions, a dark portion in the center, and a ligher portion surrounding it. The former is known as the *umbra,* or complete shadow; the latter as the *penumbra,* or partial shadow. A reference to the figure will at once make plain their origin and relation; for if S be the illuminating body, E the object whose shadow is cast on the surface, ABCD, it is seen that the small portion, *uu,* receives (omitting all consideration of refraction, dispersion, etc., of light) *no* light from S, while the whole surface outside of PPPP′ is completely illuminated. The point P′ receives light from the whole of S; the point F is only half illumined, and that by the lower part of S, the illumination of the points becoming less and less as they approach *u′*, which is unilluminated. The portion within *uu′* is the umbra, and that between the boundaries PPPP′ and *uu′* is the penumbra, which, as we have seen, gradually shades from perfect light at the outer boundary to perfect darkness at the inner, so that it is almost impossible exactly to note its limits on either side. This phenomenon, it is evident, can only occur when the illuminating body is of such a size, real or apparent, as to make the angle, P′K*u′*, of sensible magnitude; and it is equally evident that the nearer the body E approaches the plane on which its shadow is cast, the larger is the umbra and the smaller the penumbra; while by increasing the distance between E and the plane, so that the point L shall fall between them, the umbra is made to vanish, and the penumbra is increased. This is well illustrated by natural phenomena; the shadow of a man cast by the sun on the ground presents almost no penumbra; the shadow of the earth thrown by the sun upon space at the distance of the



moon gives a penumbra many times as large as the umbra; and sometimes, when the moon is new at her apogee, for instance, her shadow cast upon the earth exhibits no umbra. Spectators on the earth who see a partial eclipse of the sun, are situated within the penumbra, but within the umbra when they observe a total eclipse; while if the eclipse be annular, the umbra does not exist in the shadow cast by the moon on the earth's surface. See ECLIPSES.

PENZA, a central government of European Russia, between the government of Nijni-Novgorod on the n., and that of Tambov on the west. Area, 14,997 sq.m.; pop. '90, 1,596,500. The surface is in extensive and elevated plains, marked occasionally with ridges of low hills. The rivers are tributaries of the Don and Volga, and three of them, the Khoper, the Soura, and the Moksha, are navigable. The climate, though rather cold in winter, is temperate, agreeable, and healthy. The soil, consisting, for the most part, of black earth, is extremely fertile, and agriculture is the principal employment of the inhabitants. Grain of different kinds, leguminous plants, beet-root, flax, hemp, tobacco, and hops are the principal products. Much of the grain is used in the numerous distilleries, and considerable quantities of it are exported to the neighboring governments. About one-third of the entire area is covered with forests, some of which consist entirely of oak-trees. The manufactories are centred chiefly in the towns; cloth and leather are the principal articles made. The commercial improvement of the government is hindered by the want of direct means of communication with the consuming districts. The principal towns are Penza, Mokshansk, and Saransk.

PENZA, a t. of European Russia, capital of the government of the same name, on the Soura, 440 m. s.s.e. of Moscow. It was founded in the middle of the 17th c., as a defense against Tartar invasion, is a handsome town, occupying an elevation, and containing churches, convents, many gardens, a large park, with a beautiful fruit-garden and a horticultural school. It possesses cloth-factories, iron-works, tanneries, soap-boiling and candle-making establishments. The principal articles of commerce are corn and timber, which is floated down the Soura during spring. Pop. '97, 55,680.

PENZANCE, a market and sea-port t., and a municipal borough of England, in the co. of Cornwall, stands on the n.w. shore of Mount's bay, 65 m. w.s.w. of Launceston. It is the most westerly town in England—the light-house on its pier being in lat. 50° 7′ n., and in long. 5° 28′ west. The town standing on a finely-curved shore, surrounded by rocky eminences, and in a fertile district, is exceedingly picturesque in situation, and is famous for its mild, though somewhat moist climate. Its esplanade, one of the finest in the w. of England, commands charming land and sea views. The chief buildings, most of which are constructed of granite, are the town-hall and corn-market, surmounted by a dome, and the chapels of St. Paul and St. Mary. There are numerous boarding-houses for the accommodation of the visitors, attracted hither by the temperate and equable climate, by the beauty of the neighboring scenery, and the curiosities of the district of Land's End. Woolen yarns and cloths are manufactured; the fishery employs upwards of 2,000 persons; agricultural produce, pilchards, and tin and copper ores produced from the mines of the vicinity are exported; and timber, iron, hemp, and hides are the chief imports. A new floating dock was opened here in 1882. The Jay Gould Atlantic cable comes ashore at P. The harbor has two piers, docks and wet docks, and a light-house. Pop. '91, 12,400.

PE'ON. See CALOPHYLLUM.

PEON. A term used in Spanish America to denote an Indian or half-breed day laborer.

PEONY, *Pæonia*, a genus of plants of the natural order *ranunculaceæ;* having large flowers, with five persistent, unequal, leafy, and somewhat leathery sepals, 5 to 10 pedals, many stamens, and 2 to 5 germens, which are crowned with a fleshy recurved stigma. The leaves are compound, the leaflets often variously and irregularly divided. The fibers of the root are often thickened into tubers. The species are large herbaceous perennials, or rarely half-shrubby; natives of Europe, Asia, and the n.w. of America. None of them are truly indigenous in Britain, although one (*P. corallina*) has found admittance into the English flora. On account of the beauty of their flowers, some of them are much cultivated in gardens, particularly the COMMON PEONY (*P. officinalis*), a native of the mountain-woods of the s. of Europe, with carmine or blood-red flowers. A variety with double flowers is common.—The WHITE PEONY (*P. albiflora*) is another favorite species. It is a native of the central part of Asia. Its flowers are fragrant. —The TREE PEONY, CHINESE PEONY, or MOUTAN (*P. moutan*), is a half-shrubby plant, a native of China and Japan. In favorable circumstances, it attains a very large size, and a height of 12 ft. or more. It has been long cultivated in China and Japan; and is now also a favorite ornamental plan in the s. of Europe, and in the s. of England and Ireland; but the late spring-frosts of most parts of Britain are injurious to it; although it can bear severe frost in winter, when vegetation is at a stand. It flowers in spring. The varieties in cultivation are numerous. It is propagated by cuttings, and also by grafting. Its germens are surrounded by a cup-shaped laciniated membrane.—The roots of most of the peonies have a nauseous smell when fresh, and those of the common peony were in high repute among the ancients as an antispasmodic—hence

the name peony, from *paion*, a Greek name of Apollo, the god of medicine—but their medicinal properties are now utterly disregarded. The globose, shining black seeds of peonies were formerly, in some countries, strung into necklaces, and hung round the necks of children, as *anodyne necklaces* to facilitate dentition. The Durians and Mongolians use the root of *P. albiflora* in their soups, and grind the seeds to mix with their tea.

PEOPLE'S PALACE, The, opened in 1887 in East London, a section inhabited solely by the very poor, is also called Beaumont Institute. It owes its existence to the personal efforts of Sir Edmund Hay Currie, and a fund left in 1840, by John B. Beaumont, for the purpose of promoting the welfare of the poor in the neighborhood of Beaumont square. This formed the nucleus for Sir Edmund's collections, amounting to over $500,000. The Draper's Company, one of the city guilds, also extended substantial aid by a yearly subscription, for ten years, of $20,000, and an additional $100,000 for the building of the technical schools. Another fortunate incident, which largely aided the project, was the publication, just at the right time, of Mr. Walter Besant's *All Sorts and Conditions of Men*. The "People's Palace" took its name from the novel, and also many of its impossible (as was claimed) ideas. For the working plan of the whole, and the practical arrangement of details, the trustees relied very much upon the experience and advice of Mr. Quintin Hogg and Mr. Robert Mitchell, who were the pioneers in the Polytechnic Institute (q.v.). As the professed object of the "People's Palace" is to provide entertainment and instruction for the two millions of people in that benighted district, it is very fortunately situated in the Mile End road. "Queen's Hall," large, and handsomely decorated, was opened by the Queen, in person, on May 14, 1887. The real work was begun Oct. 3, in some old buildings, which were fitted up temporarily for class-rooms, work-shops, etc. In 1887–88, 3716 students joined the classes, and in 1889 still more. The technical school for boys is limited to 500, age thirteen, and is designed for the better class of artisans' sons. Adjoining the "Queen's Hall" is the library and reading-room, with separate entrance. 20,000 volumes, mostly donations, have already accumulated, and there is room for 250,000. The central front, with three stories, will be a great semi-circle, flanked by the schools on the east and the technical schools on the west. There will be social and refreshment rooms above, and on the uppermost floor will be located the art school. To the west of the building, communicating with the library and "Queen's Hall," a winter garden, enclosed in glass, filled with palms and flowers, and tropical fruits, will add to the attractions. The permanent gymnasium and swimming-baths will be located in a detached building. The interest which the miserably poor of this section have manifested in the various exhibitions of pictures, flower-shows, etc., concerts by military bands and orchestral societies, even at a penny admission fee, has roused the enthusiasm of the favored portion of the community, and contributions are liberal. During the first year 1,500,000 people attended—largely the very poor. See Besant, Walter.

PEOPLE'S PARTY. See Farmers' Alliance; Populist Party.

PEORIA, a co. in central Illinois, having Peoria lake and the Illinois river for its e. boundary; drained by Spoon river and Kickapoo creek; 615 sq. m.; pop. '90, 70,378, chiefly of American birth, with colored. It is intersected by the Chicago and Alton, the Chicago, Rock Island, and Pacific, the Rock Island and Peoria, the Peoria, Decatur, and Evansville, the Cleveland, Cincinnati, Chicago, and St. Louis, the Iowa Central, and several other railroads forming junctions at Peoria and Elmwood. Its surface is slightly rolling, a large proportion covered with oak, maple, ash, and elm trees, with large tracts of open prairie. It contains extensive deposits of limestone and bituminous coal. Its soil is very fertile, producing grain in large quantities, dairy products, and fruit. Large numbers of cattle, horses, sheep, and swine are raised. Much attention is paid to agriculture, the farming being done mostly by machinery. Its manufactures are important. Co. seat, Peoria.

PEORIA, city and co. seat of Peoria co., Ill.; on the Illinois river at the outlet of Peoria lake, and on the Burlington Route, the Chicago and Alton, the Chicago, Peoria, and St. Louis, the Chicago, Rock Island, and Pacific, the Cleveland, Cincinnati, Chicago, and St. Louis, and several other railroads; 165 miles s.w. of Chicago. It contains a public and the Peoria law libraries, high and graded ward schools, public school property valued at over $500,000, numerous denominational schools, two hospitals, over 50 churches, several national, state, and private banks, and electric light and street railroad plants. The city is noted for its manufactures, the principal of which are alcohol, high wines, whisky, corn-planters, wagons, buggies, threshers, boilers, glucose syrup, plows, and drills. The U. S. census of 1890 reported in Peoria 556 manufacturing establishments, employing $15,085,862 capital and 7,706 persons, paying $4,344,012 for wages and $9,996,379 for materials, and having an output valued at $55,535,023. The city is surrounded by a beautiful rolling country, is the site of a trading post established by La Salle about 1680, was settled in 1779, and received a city charter in 1845. There are elegant residences on the bluffs and attractive parks and driveways. Pop. '90, 41,024.

PEORIA INDIANS, a tribe formerly living in n. Illinois, transferred to Kansas in 1832, and to the Indian territory in 1867.

PEPÉ, GABRIELE, was b. in 1781 at Bojano, in the present province of Molise, Italy, and was a student of law in 1799, when, on the proclamation of the Parthenopean republic, he took service in the Franco-Neapolitan army, and was consequently exiled on the fall of the new government. Subsequently he served in the Italian legion in the French army under king Joseph in Spain with great distinction, and with Murat. In 1815 he was raised by the latter to the rank of col., a grade confirmed by Ferdinand I., who gave him the command of a province, and afterwards of the garrison of Syracuse. He espoused with great zeal the cause of the revolutionary party in 1820, and was deputed to the national parliament. On the downfall of the constitutional government he was seized by the Austrians, and imprisoned at Olmutz, in Moravia; but was released at the end of two years, and retired to Tuscany; where, feeling hurt at some remarks of M. de Lamartine, then *chargé-d'affaires* in that country, on Italian patriotism, he in turn wielded the pen in defense of his countrymen with such severity that a duel resulted between him and the poet, followed by an apology from the latter. From this time he took no part in political affairs, but devoted himself to science and literature, and died at Bajano, Aug., 1849.

PEPERI'NO, an Italian term, applied by some geologists to the brown volcanic tuffs derived from augitic rocks, to distinguish them from the ordinary tufas, which name they confine to the lighter-colored pumiceous rocks that have more trachyte in their composition.

PEP'IN, a co. in w. Wisconsin, having the Mississippi river for its s.w. boundary, separating it from Minnesota; 244 sq.m.; pop. in 1890, 69,032, chiefly of American birth. It is drained by the Chippewa river, flowing through it centrally, and lake Pepin, 28 m. long in the n.w. portion. Its surface is undulating, largely covered with groves of pine and sugar-maple, especially by the river banks, and in some sections are forests which supply an active lumber trade. It contains magnesian limestone, which rises into bluffs on the shores of the lake. Its soil produces every variety of grain; other products are honey, maple sugar, and the products of the dairy. Its manufactures include furniture, lumber, and wooden-ware. Co. seat, Durand.

PEP'IN, LAKE, an expansion of the Mississippi river, forming the boundary of Pierce and Pepin counties, Wis., on the n.e., and Goodhue and Wabasha counties, Minn., on the s.w. It is 27 m. long, extending from Red Wing s. to the mouth of the Chippewa river; its greatest width is 3 miles. The lake is surrounded by bluffs of limestone, rising some 400 ft., weather-beaten into the most fantastic shapes.

PEPIN, the name of several distinguished members of the Carlovingian family; the first of whom in order was PEPIN LE VIEUX or PEPIN DE LANDEN, the founder of the family. He was of a Brabant family, and took his designation from Landen (now in Liege, Belgium). Rebelling with others of the great lords of Austrasia against the rule of Brunehaut, who was regent for the youthful king, he offered the crown to Clotaire II., king of Neustria, who, in reward of his services, created Pepin *maire du palais* of Austrasia, an office which he continued to hold during the two following reigns, and died in 639. His administration was directed to the preservation of the power and integrity of the Austrasian kingdom, and though, by opposing the various schemes of centralization proposed by the king, he fell under the royal displeasure, his conduct gained for him favor and influence with the Austrasian chiefs; his power and wealth were greatly increased, and a broad and firm path to political supremacy laid for his descendants. His son, Grimoald, who succeeded him as *maire du palais*, incautiously attempted to gather the fruits of his father's schemes before they were quite ripe, and accordingly suffered for his folly. Both he and his son Childebert were strangled in prison (656) by order of Clovis II. Pepin "the Old" left by his daughter a grandson, PEPIN LE GROS or PEPIN D'HERISTAL, who was elected by the Austrasian nobility as their chief, to protect Austrasia against the machinations of Elroin, the able *maire* of Neustria. His first step was to rid himself of the Merovingian king, who nominally ruled over Austrasia; which was effected by obtaining the condemnation of the unfortunate monarch, Dagobert II., by a council of bishops, and then putting h t to death. From this time the Merovingian rule in Austrasia ceased. Pepin as now sole ruler, but his ambition did not stop here; he had resolved on the ruin of the Merovingian monarchs, and accordingly levied a large army for the vasion of Neustria. Elroin, on his side, was equally resolved to humble the territorial aristocracy, and support the throne; and advancing into Austrasia, his army came in sight of Pepin's at Loixi. In the battle (680) which ensued, Pepin's army was totally defeated, his brother and co-ruler, Martin, was taken prisoner and put to death, and he himself narrowly escaped. Luckily for him, however, Elroin was soon afterward assassinated, and his successor, Warato, signed a treaty of peace. The incapacity and tyranny of Warato and his successor, Berthaire, discontented the Neustrian nobles, who went over to Pepin, and by this accession of power enabled him to resume the offensive. Neustria was immediately invaded, and a bloody but decisive battle at Testry (687) freed Pepin of his opponent Berthaire, who was left dead on the field, and placed Neustria at his feet. Full of moderation in the midst of triumph, and satisfied that he could not place on the throne a more obedient slave than Thierry III., the then king of Neustria, Pepin caused him to be also proclaimed king of Austrasia, but reserved for himself the sovereign power, wielding the scepter though declining the crown. From this time he ruled the whole of France (Austrasia in his own right by his

election as duke, and Neustria as *maire du palais*) with energy, and undisturbed by any internal commotion, during the lives of three other "faineant" kings, till his death in 714. He had made several campaigns (689–708) against the Frisians, but that valiant and independent race was not thoroughly subdued for some time afterward. Pepin had two legitimate sons who died before him, and an illegitimate son, Charles, subsequently known as Charles Martel (q.v.), who succeeded to his power. The third who bore this name was PEPIN LE BREF, the younger son of Charles Martel, who, on the death of his father in 741, received Neustria and Burgundy; Austrasia, Thuringia, and Subia being the heritage of his elder brother Carloman. Aquitaine was nominally a part of Pepin's dominions, though, as it was really independent under its own duke, he made several attempts to subdue it; but the duke was quite able to hold his own against both Pepin on the one hand and the Arabs (from Spain) on the other. The farce of governing the country in the name and as the chief minister of the Merovingian sovereign was still kept up, though Pepin was eagerly longing for an opportunity to assume the crown; but the present time was inopportune, as no sooner was the restraint of Charles Martel's iron hand removed by death, than revolts broke out in all quarters among the Franks, Germans, Bavarians, and Gascons. The country by the united exertions of Pepin and Carloman, was restored to tranquillity about 745. Those princes who had excited the insurrection were mostly deposed, and otherwise punished, and the duke of Aquitaine was compelled to acknowledge at least the nominal sovereignty of Pepin. In 747 Carloman bade adieu to power, and retired into a convent, leaving his government to his sons, who were immediately dispossessed by Pepin. After crushing a rebellion of Saxons and Bavarians, Pepin began to carry out his favorite project of dispossessing the Merovingian dynasty of even the semblance of authority, and of originating in person a new royal dynasty. To gain his point he flattered the clergy, then the most influential body in France; and as they had been despoiled by Charles Martel for the behoof of his warriors, a moderate degree of kindness and generosity on the part of Pepin contrasted him so favorably with his father, that the clergy at once became his partisans. So did the pope, who felt the importance of securing the aid of the powerful Frankish chief against the Lombards, who were then masters of Italy, and released the Franks from their oath of fidelity to Childeric, the Merovingian monarch. On learning this Pepin at once caused himself to be elected king by the assembly of estates at Soissons, and was consecrated by the bishop of Mayence (Mar. 752). Childeric retired to a convent, where he died in 755. Pepin was the first Frankish monarch whose election received the sanction of the pope, and who was consecrated to his high dignity; and these solemn ceremonies put the crown to a great extent at the mercy of the clergy, who from this time took a political rank in the state. The practice, too, followed by Pepin and his predecessors in office, of gaining partisans by granting particular fiefs to various chiefs, greatly strengthened the feudal system, and proportionally weakened the royal power. This effect, however, did not show itself till after the subsequent reign of Charlemagne, on account of the personal genius of these two rulers. Pepin was soon called upon to aid the pope against the Lombards, and marching into Italy at the head of a large army, he compelled Astulf, the Lombard king, to retire from the siege of Rome, and restore several cities which had previously belonged to the Greeks; these were now handed over to the pope. He had hardly returned to France, when he was anew summoned (755) to Italy, the Lombards having broken their engagements. This time he took Ravenna, Emilia, the Pentapolis, and the duchy of Rome from the Lombards, reuniting them to the Holy See. After the settlement of affairs in Italy, the turbulent nations on his eastern frontier demanded his attention. The Saxons and other German tribes were defeated (757), their country cruelly ravaged, a heavy tribute exacted, and numbers of captives and hostages taken. Resolved to unite the whole of Gaul under his authority, he eagerly accepted the invitation of the Visigoths of Septimania to aid them against the Arabs, who had taken possession of the country; and after a war of many years' duration, Narbonne, the last of the Arab strongholds, was taken, and the country, freed of these invaders, at once acknowledged Pepin's authority. The remaining years of his reign were occupied in reducing the independent monarchy of Aquitaine, which was not accomplished till, after nine years (760–68) of desolating warfare, Pepin obtained the assassination of his opponent, duke Waifre, whose partisans then laid down their arms, surrendering to the Frankish monarch the vast provinces which stretch from the Loire to the ocean and the Pyrenees. Shortly after this conquest, Pepin died of dropsy, Sept. 768. He was a most active, enterprising, and in general fortunate prince; he established the unity of the Gallic nation, and protected it as far as could be done by invading and ravaging the territories of the neighboring nations, though he also introduced those elements of weakness into its constitution which reduced the authority of his successors to such a deplorable state. The others of this name, though important personages at the time, make little figure in history.

PEPOLI, CARLO, Count, b. Italy, 1801; educated at the university of Bologna. After the downfall, in 1831, of the revolutionary government of which he was a member, he was captured by the Austrians and imprisoned. Soon afterwards he was banished, and went to Paris, and later to London, where he gave a course of lectures on Italian history, and was professor of Italian literature in the university of London. He took

part in the revolution of 1848, was a deputy, and vice-president of the assembly, and, on the collapse of the revolutionary movement in 1849, returned to England, where he remained till 1859. While in Paris he wrote the libretto of Bellini's opera, *I Puritani*, and was author of a number of works in prose and verse. He d. 1866.

PEPPER, *Piper*, a genus of plants of the natural order *Piperaceæ* (q.v.), which once included the whole of that order; but, as now limited, consists of plants with woody stems, solitary spikes opposite to the leaves, and covered with flowers on all sides, the flowers mostly hermaphrodite. The most important species is COMMON PEPPER or BLACK PEPPER (*P. nigrum*), a native of the East Indies, now cultivated also in many tropical countries, and extensively in some parts of the new world; its fruit being the most common and largely used of all spices. It is a rambling and climbing shrub, with smooth and spongy stems, sometimes 12 ft. in length; and broadly ovate, acuminate, leathery leaves. The fruit is about the size of a pea, of a bright-red color when ripe, not crowded on the spike. In cultivation, the pepper plant is supported by poles, or by small trees planted for the purpose, as it loves a certain degree of shade, and different kinds of trees are often planted for this purpose in India. It is propagated by cuttings, comes into bearing in three or four years after it is planted, and yields two crops annually for about twelve years. When any of the "berries" of a spike begin to change from green to red, all are gathered, as when more fully ripe they are less pungent, besides being apt to drop off. They are spread on mats and separated from the spikes by rubbing with the hands or by threading with the feet, after which they are cleaned by winnowing. The *black pepper* of commerce consists of the berries thus dried, and become wrinkled and black; *white pepper* is the seed freed from the skin and fleshy part of the fruit, to effect which the dried fruit is soaked in water and then rubbed. White pepper thus prepared is of a whitish-gray color, but not unfrequently undergoes a bleaching by chlorine, which improves its appearance at the expense of its quality. Black pepper is much more pungent than white pepper, the essential constituents of the spice being more abundant in the outer parts of the fruit than in the seed. Pepper depends for its properties chiefly on an acrid resin and an acrid volatile oil; it contains also a crystalline substance called *piperin*.—The fruit of *piper trioicum*, a species very similiar to the common pepper, is more pungent; and it is cultivated in some parts of India.—The fruit of other species of *piperaceæ* is used as pepper in their native countries; that of *cocobryon capense* at the cape of Good Hope; that of *peltobryon longifolium*, of *artanthe crocata*, of *A. trichostachya*, and of *serronia jaborandi* in South America.—*Chavica Roxburghii* and *C. officinarum* yield the LONG PEPPER of druggists. They have woody climbing stems, solitary spikes opposite to the leaves, dicœcious flowers, and the fruits so close together on the spikes as in ripening to become a compact mass. The spikes are gathered when unripe, and dried in the sun. They are used in pickling and for culinary purposes, also in medicine for the same purposes as common pepper. They are generally reputed to be more pungent than common pepper. *C. Roxburghii* is cultivated in Bengal and the Circars, where it is called *pippul; C. officinarum* in the Dutch East Indian colonies. The root and thickest part of the stem of *C. Roxburghii* are extensively used in India as a stimulant medicine; and are cut into small pieces, dried, and brought to the market under the name of *pippula moola*.

Pepper acts on the skin as a rubefacient and vesicant, and is often used for this purpose in a powdered state, moistened with some kind of alcoholic spirit. It is also employed as a local stimulant in relaxation of the uvula, and is applied in the form of an ointment to ringworm. Taken into the stomach in small quantities it is a pleasant stimulant, but in large doses it produces great pain and irritation. The quantity used, however, by the natives of hot climates much exceeds anything known among Europeans, and the effects are evidently beneficial rather than injurious. The chief use of pepper is as a spice and condiment.

Pepper was known to the ancients; Hippocrates used it as a medicine; and Pliny expresses his surprise that it should have come into general use, considering its want of flavor. In the middle ages pepper was one of the most costly spices, and in the 13th c. a few pounds of it were reckoned a princely present. The quantity now imported into Europe is immense.

The name pepper is popularly given to substances possessing a pungency resembling that of pepper, although produced by very different plants. Thus, CAYENNE PEPPER is the produce of species of *capsicum*, of the natural order *solanaceæ;* JAMAICA PEPPER (or PIMENTO) of species of *Eugenia*, of the natural order *myrtaceæ;* and GUINEA PEPPER, or MELEGUETTA PEPPER, of species of the natural orders *scitamineæ* and *anonaceæ*. See CAPSICUM, PIMENTO, GRAINS OF PARADISE, and GUINEA PEPPER.

PEPPER, WILLIAM, b. 1843, an American physician, provost 1881–94 of the university of Pennsylvania, during which time the university made great progress. He has written many medical works and publications on sanitary matters.

PEPPERELL, Sir WILLIAM, 1696–1759; b. Maine; son of a Welsh emigrant. He was for many years a successful merchant; from 1727 until his death he was a member of the king's council for Massachusetts, and in 1730 was made chief-justice of the common pleas court. His title was bestowed upon him for his success as commander of the expedition which captured Louisburg in 1745. In 1748 he visited England and received

the grades of colonel, major-general, and lieutenant-general, in the British army. He was president of the Massachusetts council in 1755, and acted as governor of the province (1756–8). For many years he was a commissioner to treat with the Indians of New England, and in 1753 published *Conference with the Penobscot Tribe.* His life was written by Usher Parsons. Wm. P. Sparhawk, his grandson, took Sir William's name, succeeded to his great estates, and was made a baronet in 1774. The property was confiscated in 1778 on account of the owner's attachment to the British cause.

PEPPER GRASS, *Depidium Sativum.* See CRESS.

PEPPERIDGE. See BLACK GUM.

PEP'PERMINT. See MINT.

PEPPER-POT, a celebrated West Indian dish, of which casareep (q.v.) is a principal ingredient; and along with it flesh or dried fish, vegetables, chiefly the unripe pods of the ochro (see HIBISCUS), and chillies (see CAPSICUM).

PEPPER-ROOT, *Dentaria diphylla,* a perennial herbaceous plant, of the natural order *cruciferæ,* a native of North America, with pairs of ternate leaves, and racemes of white flowers; the root of which has a pungent mustard-like taste, and is used as a condiment.

PEPPER TREE. See SCHINUS.

PEPSIN has been already described (in the article DIGESTION) as one of the essential constituents of the gastric juice. Various modes of extracting it from the walls of the stomach of the calf, sheep, and pig have been proposed by different chemists (Wasmann, Frerichs, Schmidt, Boudault, and others), into which it is unnecessary to enter. According to Schmidt's analysis, it contains 53.0 per cent of carbon, 6.7 of hydrogen, 17.8 of nitrogen, and 22.5 of oxygen, and hence in its ultimate composition it is closely allied to albumen. This substance, either as a powder or in solution, has been employed of late years to a considerable extent in medical practice, in cases of disordered digestion from deficient or imperfect secretion of gastric juice, and of convalescence from typhoid and other debilitating fevers. Pepsin wine is perhaps the best form in which to prescribe this substance; a teaspoonful being the ordinary dose.

PEPTONES. See PROTEIDS, also DIGESTION.

PEPYS, SAMUEL, a distinguished officer of the admiralty during the reigns of Charles II. and James II., was b. Feb. 23, 1632–33. He was the son of a London citizen, a tailor, but was well educated, first at St. Paul's school, and afterwards at Magdalen college, Cambridge. His cousin, sir Edward Montague (the first earl of Sandwich), introduced him to public employment. In 1660 he was appointed clerk of the acts of the navy, and in 1673 secretary for the affairs of the navy. He was an excellent public servant, acute, diligent, and laborious; but during the fanatical excitement of the Popish plot he was committed to the tower, on an unfounded and absurd charge of aiding in the design to dethrone the king and extirpate the Protestant religion. Having been discharged without a trial, Pepys was replaced at his post in the admiralty, which he retained till the abdication of James II. For two years he held the honorable station of president of the royal society. He died May 26, 1703. Pepys wrote *Memoirs of the Royal Navy,* 1690. He left to Magdalen college his large collection of books, MSS., and prints, including about 2,000 ancient English ballads, forming five folio volumes. This curious collection was begun, he says, by Selden, and continued down to the year 1700, when the form peculiar to the old ballads, namely, the black letter with pictures, was laid aside for the simpler modern fashion. Pepys is now best remembered for his *diary,* deciphered by the Rev. J. Smith from the original short-hand MS. in the Pepysian library, Cambridge, and first published, under the editorial care of lord Braybrooke, in 1825. It commences on Jan. 1, 1659–60, and is continued for above nine years, when the diarist was obliged from defective eyesight to abandon his daily task. As a picture of the court and times of Charles II. this *diary* is invaluable; the events, characters, follies, vices, and peculiarities of the age are presented in true and lively colors, and the work altogether is one of the most racy, unique, and amusing books in the language. The fullest edition is that by H. B. Wheatley, which appeared in 1893.

PE'QUOTS, or PEQUODS, an Algonquin tribe of Indians, who were, probably, originally a part of the Hudson river Mohegans, but on the arrival of the English occupied a small tract of land in Rhode Island near the Niantic river. They were a very warlike race and constantly battling with the Narragansetts and other tribes. At first they were friendly to the whites, but soon became dissatisfied and hostile. Endicott and Gardiner led expeditions against them, and they retaliated by a massacre at Wethersfield. In 1673 Capt. John Mason led an expedition from Hartford against the Pequots, who were encamped at two forts near the site of Mystic. His force of 90 white men was joined by several hundred Mohegans under Uncas. The surprise was complete, the wigwams were fired, over 600 of the Pequots were killed, and as a tribe they ceased to exist. A small number carried on the fight from the swamps, but were before long slain or taken prisoners. Many were sold as slaves to the West Indies, others were scattered among different tribes, while Sassacus, the chief, was slain by the Mohawks to whom he had fled for refuge. Laws were made in 1655 for two bands of Pequots which had gathered at Ledyard and North Stonington. They were faithful allies in Philip's war and the

troubles with the French, but decreased rapidly in numbers. A few are still to be found in Wisconsin. An account of the Pequot war was written by Mason and published in Increase Mather's *Relation of Troubles by the Indians*, 1667.

PE'RA, a suburb of CONSTANTINOPLE (q.v.).

PERÆ'A (from *περαν, beyond*), a name given to a part of Palestine, e. of the river Jordan, anciently belonging to the tribes of Reuben and Gad. Josephus bounds it on the N. by Pella, E. by Philadelphia, S. by the castle of Machærus, and W., by the Jordan. It is naturally a fertile region, well watered by mountain torrents and springs. See GILEAD and BASHAN. It was the scene of a part of the ministries of John the Baptist and of Christ.

PERAK, one of the largest Malay states in the peninsula of Malacca, extends about 90 m. along the strait of Malacca, and some 45 m. inland. The soil is fertile, and for the most part covered with luxuriant vegetation. The mineral wealth is very great, and comprises abundance of tin, some gold and plumbago, and poor coal. Elephants, tigers, leopards, bears, and boars, and occasionally a rhinoceros, are found. Perak is thinly inhabited by various races, of whom the Malays are the most numerous. Some of the others are of the same stock as the inhabitants of Sumatra; there are wild hill-tribes in the interior. Cannibalism is still practiced by some of these races. Perak is governed by a sultan and petty chiefs, who have of late come under British influence, represented by a resident and his assistants. The murder of the British resident in 1875 has made the name of Perak more familiar to Englishmen. Pop. '91, 214,254. See maj. M'Nair's *Perak and the Malays* (1877).

PERAMBULATION OF PARISHES. The ancient custom in England of perambulating parishes in rogation week had a twofold object. It was designed to supplicate the divine blessing on the fruits of the earth; and to preserve in all classes of the community a correct knowledge of, and due respect for, the bounds of parochial and individual property. It appears to have been derived from a still older custom among the ancient Romans, called Terminalia, and Ambarvalia, which were festivals in honor of the god Terminus and the goddess Ceres. On its becoming a Christian custom the heathen rites and ceremonies were of course discarded, and those of Christianity substituted. It was appointed to be observed on one of the rogation (q.v.) days, which were the three days next before ascension day. Before the reformation parochial perambulations were conducted with great ceremony. The lord of the manor, with a large banner, priests in surplices and with crosses, and other persons with hand-bells, banners and staves, followed by most of the parishioners, walked in procession round the parish, stopping at crosses, forming crosses on the ground, "saying or singing gospels to the corn," and allowing "drinkings and good cheer" (Grindal's *Remains*, pp. 141, 241, and *Note;* Whitgift's works, iii. 266–267; Tindal's works, iii. 62, 234, Parker society's edition), which was remarkable, as the rogation days were appointed fasts. From the different practices observed on the occasion the custom received the various names of *processioning, rogationing, perambulating* and *ganging the boundaries;* and the week in which it was observed was called *rogation week; cross week,* because crosses were borne in the processions; and *grass week,* because the rogation days being fasts, vegetables formed the chief portion of diet.

At the reformation, the ceremonies and practices deemed objectionable were abolished, and only "the useful and harmless part of the custom retained." Yet its observance was considered so desirable, that a homily was prepared for the occasion; and injunctions were issued requiring that for "the perambulation of the circuits of parishes, the people should once in the year, at the time accustomed, with the rector, vicar, or curate, and the substantial men of the parish, walk about the parishes, as they were accustomed, and at their return to the church make their common prayer. And the curate, in their said common perambulations, was at certain convenient places to admonish the people to give thanks to God (while beholding of his benefits), and for the increase and abundance of his fruits upon the face of the earth, with the saying of the 103d Psalm. At which time also the said minister was required to inculcate these, or such like sentences, Cursed be he which translateth the bounds and doles of his neighbor; or such other order of prayers as should be lawfully appointed." (Burn's *Ecclesiastical Law*, vol. iii. 61).

To this day, questions of disputed boundary between parishes are invariably settled by the evidence afforded by these perambulations; for in such questions, immemorial custom is conclusive. And so far are they recognized in law, that the parishioners on such occasions are entitled to trespass on lands, and even to enter private houses if these stand on the boundary line. In Scotland, where the parochial principle has never been developed as in England, there seem to be few traces of a similar practice. But, as between neighboring landowners, a brieve of perambulation is the technical remedy for setting right a dispute as to boundaries or marches; and perambulating or "riding" the bounds or boroughs is a common practice.

The necessity or determination to perambulate along the old track often occasioned curious incidents. If a canal had been cut through the boundary of a parish, it was deemed necessary that some of the parishioners should pass through the water. Where a river formed part of the boundary line, the procession either passed along it in boats,

or some of the party stripped and swam along it, or boys were thrown into it at customary places. If a house had been erected on the boundary line, the procession claimed the right to pass through it. A house in Buckinghamshire, still existing, has an oven passing over the boundary line. It was customary in the perambulations to put a boy into this recess to preserve the integrity of the boundary line.

At various parts of the parish boundaries, two or three of the village boys were "bumped"—that is, a certain part of the person was swung against a stone wall, a tree, a post, or any other hard object which happened to be near the parish boundary. This, it will scarcely be doubted, was an effectual method of recording the boundaries in the memory of these *battering-rams*, and of those who witnessed this curious mode of registration.

The custom of perambulating parishes continued in some parts of the kingdom to a late period, but the religious portion of it was generally, if not universally, omitted. The custom has, however, of late years been revived in its integrity in many parishes.

PERAMELES. See BANDICOOT.

PER CAPITA, in law used technically to denote that kind of succession to the real or personal property of an intestate which is opposed to the succession by representation, or, as it is called, *per stirpes* (q.v.). Thus if A B leave three sons and three grandsons living at the time of his death and his property be divided into six equal parts, the next of kin are said to inherit *per capita*, i.e., by the head or poll. The statutes of each state determine whether, if the deceased were intestate, the succession shall be *per capita* or *per stirpes*. The latter method is the more common.

PERCEPTION. This word refers to our reception of knowledge through the senses, an operation that to the common understanding seems simple enough, but, viewed philosophically, is attended with much difficulty. Perception, considered as a source of knowledge, refers exclusively to the outer, or the object world—the world of extended matter and its properties. The names for the act of knowing one's own mind—the feelings and thoughts of the individual—are self-consciousness and self introspection. The word "consciousness," is sometimes improperly limited to this signification. Locke used the term "reflection" for the same meaning, but this is ambiguous and is now disused. All our knowledge is thus said (by those that deny innate ideas) to spring from two sources—perception and self-consciousness.

Two great disputes connect themselves with perception, both raised into their full prominence in the philosophical world by bishop Berkeley. The first is the origin of our judgments of the distances and real magnitudes of visible bodies. In opposition to the common opinion on this subject, Berkeley maintained that these were learned by experience, and not known by the mere act of vision. See VISION.

The second question relates to the grounds we have for asserting the existence of an external and material world, which, in the view of Berkeley, was bound up with the other. Inasmuch as perception is a mental act, and knowledge is something contained in a mind, what reason have we for believing in the existence of objects apart from our minds? or what is the mode of existence of the so-called external world.

The following sentences show in what manner Berkeley opened up the question: "That neither our thoughts, nor passions, nor ideas, formed by the imagination, exist without the mind, is what everybody will allow; and it seems no less evident that the various sensations or ideas imprinted on the sense, however blended or combined together (i.e., whatever objects they compose), cannot exist otherwise than in a mind perceiving them. I think an intuitive knowledge may be obtained of this by any one that shall attend to what is meant by the term *exist* when applied to sensible things. The table I write on, I say, exists—i.e., I see and feel it; and if I were out of my study, I should say it existed, meaning thereby that if I was in my study I might perceive it, or that some other spirit actually does perceive it. There was an odor—i.e., it was smelled; there was a sound—that is to say, it was heard; a color or figure, and it was perceived by sight or touch. This is all I can understand by these and the like expressions. For as to what is said of the absolute existence of unthinking things, without any relation to their being perceived, that seems perfectly unintelligible. Their *esse* is *percipi*, nor is it possible they should have any existence out of the minds or thinking things which perceive them."

This doctrine of Berkeley, amounting, it was said, to a denial of the existence of a material world (which is far from a correct view of it), was followed up by Hume, who, on similar reasoning, denied the existence of mind, and resolved the universe into a mere flow of ideas and impressions without any subject to be impressed, acknowledging nevertheless, that he felt himself unable, practically, to acquiesce in his own unanswerable arguments. There was obviously some great mistake in a mode of reasoning that brought about a dead-lock of this description; and hence it has been the work of *metaphysical* philosophy since that time to endeavor to put the perception of the world on an admissible footing.

Dr. Reid reclaimed against Berkeley and Hume by appealing to common sense, or unreasoning instinct, as a sufficient foundation for our belief in the existence of a world apart from our own minds. Sir W. Hamilton has expounded the same view with greater clearness and precision. He considers that our consciousness tells us at once that in the

act of perceiving there is both a *perceiving subject*—self, or the mind—and an *external reality*, in relation with sense, as the *object perceived.* "Of the existence of both these things," he says, "I am convinced; because I am conscious of knowing each of them, not mediately in something else, *as represented*, but immediately in itself, *as existing.* Of their mutual dependence I am no less convinced; because each is apprehended equally and at once, in the same indivisible energy, the one not preceding or determining, the other not following or determined; and because each is apprehended out of, and in direct contrast to the other."—*Reid*, p. 747.

Much as Hamilton has labored to elucidate this doctrine in all its bearings, it has not been universally accepted as satisfactory. Many believe that he has regarded as an ultimate fact of our constitution what admits of being still further resolved, and has mistaken an acquisition of the mature mind for a primitive or instinctive revelation.

Professor Ferrier, in his *Institutes of Metaphysic*, has gone through the question with extraordinary minuteness and elaboration. His main position is the inseparability of the subject and the object in perception (a position also maintained by Hamilton in the above extract) which is not reconcilable with the common assumption as to the independent existence of matter. Indeed, he reduces the received dogma of the existence of matter *per se* to a self-contradiction, and builds up a system in strict conformity with the correlation, or necessary connection, of the mind perceiving with the object perceived. He thus approaches nearer to Berkeley than to Hamilton or to Reid.

Those who would endeavor to show that our notion of the outer world is a complex fact, and an acquisition, and not a simple apprehension of the uneducated mind, explain themselves to the following effect. It is in the exercise of *force* that we have to look for the peculiar feeling of the externality of sensible things, or the distinction that we make between what impresses from without, and impressions not recognized as outward. Any impression that rouses a stroke of energy within us, and that varies exactly and constantly as that energy varies, we call an outward impression. Dr. Johnson refuted Berkeley, as he thought, by kicking a stone. But in fact it was his own action with its consequences, and not the optical impression of a stone in the eye, that satisfied him as to the existence of something outward. The sum total of all the occasions for putting forth active energy, or for conceiving this as possible to be put forth, is our external world.

We experience certain uniformly recurring sensations, and certain uniform changes in these, when we exert particular energies. Thus the visible picture of our dwelling is a permanent and habitual experience, and the variations of appearance that it is subject to correspond principally to our own conscious movements. As we move from one end of a room to another, we experience a change of the visible aspect at every step, and this regularly happens as often as we repeat the movement. But at times the appearance exists in another shape, to which we give the name of memory or *idea.* We draw a marked distinction between these two modes of presentation, the actual and the ideal, and we assign a superiority to the one over the other. The superiority we find connects itself with the relation to our own movements; a mere idea or mental picture remains the same whatever be our bodily position or bodily exertions; the sensation that we call the *actual* is entirely at the mercy of our movements, shifting in every possible way (but uniformly), according to the varieties of action that we go through. With a forward movement the visible impression enlarges, with a backward movement it diminishes. A certain movement of the eye shuts it out, another restores it. The raising of the head and the bending of the body are followed by an altered spectacle. We cannot but draw a broad distinction between the mental scenery that is thus shifted by all our movements, and the ideas and dreams that vary of themselves while we are still. To express the one fact, we use the terms externality, the material world, independent existence; to express the other we employ the opposite language, internality, the world of mind, etc. Even if sensation were only in ourselves, we should still have to distinguish between present sensation and remembered or revived sensation, the reference of the one to our voluntary movements, and of the other to no such modifying causes, would oblige us to note a vital difference in the two classes of facts. Such is the uniformity of connection between certain appearances and certain movements, that we come to anticipate the one through the other. We know that in some one position, as when lying in bed, certain movements of the limbs and back will bring us to the sensation of a solid contact in the feet; that another series of movements will bring on a particular view to the sight; that a third movement will give the sound of a bell in the ear, and so forth. We cannot avoid regarding those various sensible effects, brought uniformly into play by a regular series of waking voluntary actions, as totally different from our ideas, recollections, and dreams.

As our belief in the externality of the causes of our sensations means that certain actions of ours will bring the sensations into play, or modify them in a known manner, this belief is readily furnished by experience, and is no more than our experience entitles us to entertain. When we have been repeatedly conscious that a tree becomes larger and larger to the eye in connection with a definite locomotion on our part, called the forward advance; that this movement brings on at last a sensation of touch; that this sensation of touch varies with definite movements of the arms, and so on; the repetition of all this train of experience fixes it on the mind, so that from one thing alone, as from

the distant vision of the tree, we can anticipate, or as it is otherwise called, *perceive* all the other consequences. We then know, without going through the steps, that the specified movements will bring about all the sensations above described, and we know nothing else; this knowledge, however, is to us the recognition of external existence, the actual fact that is meant when a material world is spoken of. Belief in external reality is the sure anticipation of certain sensations on the performance of certain movements; everything else said to be implied in it is but a convenient hypothesis for aiding the mind in holding together those multifarious connections that our experience has established in the mind. In order to account for the fact that the conscious movement of elevating the upper eyelid is followed with the sensation of light, to us and to other minds, we suppose a luminous agency always existing even when not affecting us or any other person: we cannot know or verify this supposition—it is a generalization founded upon particular experiences, and serving to sum up those experiences in a convenient form, but no such perennial independent substance can be absolutely proved.

PERCEVAL, John, first Earl of Egmont, was born at Barton, England, in 1680. He deserves notice as one of the principal founders of the colony planted in Georgia in 1732. He was also the author of a number of minor works. He died in 1748. See Georgia.

PERCEVAL, Spencer, Right Hon., English minister, was the second son of John, earl of Egmont; born Nov. 1, 1762; educated at Harrow, and at Trinity college, Cambridge. He was called to the bar, and soon obtained a reputation as a diligent lawyer. A clever pamphlet on the abatement of the impeachment of Warren Hastings made him known to Pitt. Obtaining a seat in parliament for Northampton, he was soon conspicuous for his extreme horror of popery and his violent advocacy of what was called by his party the "Protestant interest." In the Addington administration he was made solicitor-general in 1801, and attorney-general in 1802. He was afterwards induced to abandon his profession and adopt a political career. In the Portland administration of 1807 he was made chancellor of the exchequer, and was even then the real head of the government, his influence with George III. being obtained by the depth of his bigotry and his pertinacious opposition to the Catholic claims. On the death of the duke of Portland, in 1809, Perceval became premier, uniting to his office of chancellor of the exchequer that of first lord of the treasury. He was retained in power by the prince of Wales on his accession to the regency. On May 11, 1812, about 5 P.M., as Perceval was entering the lobby of the house of commons, a man named Bellingham fired a pistol at him, the ball pierced his heart, and he instantly expired. The assassin made no attempt to escape. He was a Liverpool broker trading with Russia, who, having sustained some losses and injuries which he had vainly applied to the government to redress, determined to avenge himself by taking the life of the prime minister. Perceval's assassination shocked the public mind, and parliament hastened to make an ample provision for his widow and numerous family. His death was, however, rather a private than a public calamity. "With all my respect for the virtues and excellences of the late minister," said the marquis of Wellesley, who had held the office of foreign secretary in his administration, "I still feel it my duty to say that I did not consider him a fit man to lead the councils of this great empire." He was ready in debate, a placid and not ungraceful speaker, and led the house of commons with much tact; but he was superficial and intolerant. Sydney Smith, in his *Letters of Peter Plymley*, has conferred a species of immortality upon him by his wit and sarcasm. It was the fashion, when Perceval's public policy was attacked, to laud his domestic virtues. "Peter" said, if he had to choose between public and private virtues, he should prefer that Mr. Perceval "owed for the veal of the preceding year, whipped his boys, and saved his country."

PERCEVAL. *The Quest of the Graal* (q.v.) or *Cup*, one of the romances of the Knights of the Round Table, is generally supposed to have been written at a later period than the *History of the Holy Graal*, and to have been the result of compilations from the French and other sources; hence the statements concerning the reason of the Quest vary considerably. According to some traditions, St. Joseph of Arimathea was the ever-living possessor of the Graal; others say he died after several centuries had elapsed, having bestowed his authority and the precious relic on his son. Robert de Barron's history, written about 1160–70, and revised later in connection with Walter Map or Mapes (q.v.), tells us that Christianity was introduced into Britain during the first century of our era, by Joseph of Arimathea (q.v.), sometimes confounded with a bishop named Joseph, sent by St. Augustine from Africa to England, and sometimes with Joseph the centurion. He was allowed by Pilate to take down the body of Christ from the cross, and was given also the chalice or cup used by Christ at the Last Supper. This cup or graal (q.v.) had received the blood which flowed from His side on the cross, and was treasured by Joseph during his imprisonment for fifty years by the Jews, although one legend states that it was lost during a part of that time, and restored to him in his cell by Christ Himself. The apocryphal gospel of Nicodemus mentions this tradition. Joseph is said to have been preserved in life and health during his imprisonment by the possession of the Holy Graal, and to have been released by the Saviour in person, who taught him the words of the mass, and bade him celebrate daily the sacra-

ment of the Last Supper. Other authorities state that Vespasian (q.v.) heard of Christ, freed Joseph from prison, became a Christian, and reduced the Jews to slavery. After his release from prison, Joseph joined his brother-in-law Bron, le Roi Pêcheour, taking with him the graal and some other relics, and they formed a society for their preservation. Some of his adherents having sinned secretly, Joseph was told to make a test of righteousness and sin through the holy blood, by the voice of Jesus, which issued from the cup, and repeated His own words about Judas, "He who shall betray Me is eating and drinking with Me." The promise was also given that the place of the rejected Judas should be filled, but not until Bron's grandson (the third man of Joseph's lineage) should be fit to take it. Joseph did as he was directed, and some fish and the Graal, were spread upon the table. Those who could find place at the board were blessed with a feeling of satisfaction and were acknowledged to be righteous; those whose sins forbade them were recognized as the licentious, who had caused the distress among them. Alan, the son of Bron, after beholding the Holy Graal, and being taught by Joseph all things concerning it, departed with his kinsmen to the far West, to the isle of Avalon, or Avaron, preceded by Petrus, to whom was intrusted a letter which contained an account of the precious relics. Respecting the history of young *Perceval*, who is the hero of the *Quest*, we have also conflicting accounts. One is to the effect that he was an inexperienced youth, who knew nothing of his birth or destiny, nor of arms nor chivalry, but who had always lived in retirement with his mother. By his skill and courage he was advanced to knighthood, and finally reached the court of king Arthur (q.v.), where he was inspired to set out on the Quest of the Holy Graal. The story of Robert de Barron continues the history of Joseph's family from the time, when according to promise, Perceval, the son of Alan, grandson of Bron, le Roi Pêcheour (the brother-in-law of Joseph), and the third man of Joseph's lineage, was grown to manhood. He was predestined from his birth to be the one sufficiently pure to worthily guard the Holy Graal or Cup, and fill the vacant place of Judas at the table prepared by his grandfather Bron and Joseph of Arimathea at the command of Christ. But before this fact could be revealed to him, and he could be thus honored, he must prove himself to be the best knight in the world, spotless in soul and body. He joined the Knights of the Round Table and set forth upon the Quest with others, it being hidden from all that the Graal was still in the possession of Bron. Perceval after many adventures arrived at the secret place of the Graal, saw his grandfather, the lance, the broken sword, and the Graal, but without recognizing his locality or his grandfather. In a second attempt he was more successful, and Bron revealed himself, related the story, explained the sign of the lance which pierced the Saviour's side, and communicated everything which was reserved for the third of his lineage. Then the fisher-king died and all the enchantments of Britain passed away, leaving Perceval in possession of the Grail. In the version of Wolfram von Eschenbach, there was a similar story of a succession of Grail-kings, beginning with Titurel and ending with Partzifal; the scene was changed to Anjou and Spain, a book found in Toledo, with several Moorish and Catalan names was given as the authority for the history, and finally the Grail-kings and their people were mixed up with the Templars struggling against the heathens. It is upon Von Eschenbach's version that Wagner (q.v.) founded his opera of *Parzifal*. For continuation of *The Quest of the Grail*, see LANCELOT.

PERCH, *Perca*, a genus of acanthopterous fishes, of the family *percidæ*, to which it gives its name, and which includes many genera and a very great number of species both of marine and fresh-water fishes. The *percidæ*, or perch family, have the body somewhat oblong and more or less compressed; the scales rather large; the bones of the gill-covers toothed or otherwise armed; the mouth without barbels; the *vomer* toothed, and generally also the palate; there are sometimes two dorsals, sometimes only one. To this family belong not only the true perches, all of which are fresh-water fishes, but the lates of the Nile, the bass (q.v.) or sea-perch, and their congeners the pike perches, the *serrani*, and many other fishes. The true perches (*perca*) have two dorsal fins, distinct and separate, the rays of the first spinous and those of the second flexible; the tongue is smooth; and the gill-covers are bony, notched, and sharply serrated. The COMMON PERCH (*P. fluviatilis*) is an inhabitant of the lakes, ponds, and still rivers of almost all parts of Europe. It is very common in England and Ireland, and is found in many of the waters of the s. of Scotland, although in the n. it is rare, and is said to exist only where it has been introduced. But it is found in Scandinavia, and even in Lapland. It is of a greenish-brown color, passing into golden yellow on the under parts, and marked on the back with six or seven indistinct blackish cross-bands. Its height is about one-third of its length. It often attains a length of 16 or 18 in., and a weight of 2 or 3 lbs., but perches have been taken of 8 lbs. weight or more. The perch loves still waters, and is easily reared in ponds, but it is not a desirable inmate of ponds intended for other fish, because it is very voracious, and devours their fry. It is readily caught by almost any kind of bait, and sometimes takes a small artificial fly. It is much esteemed for the table. It lives a long time out of the water if kept moist, and in some countries is thus brought to market, and carried back to the pond if not sold. The female perch deposits her eggs in long strings, united by a viscid matter.—A species of

perch (*P. Italica*), found in the s. of Europe, differs from the common perch in its shorter and deeper form, and want of black bands.

PERCH. See ROD.

PERCHÉ, NAPOLEON JOSEPH, D.D., was born at Angers, France, in 1805, and entering the Catholic priesthood removed in 1837 to the United States. In 1870 he became Bishop of Abdera *in partibus*, and in the same year Archbishop of New Orleans. He died, Dec. 26, 1883.

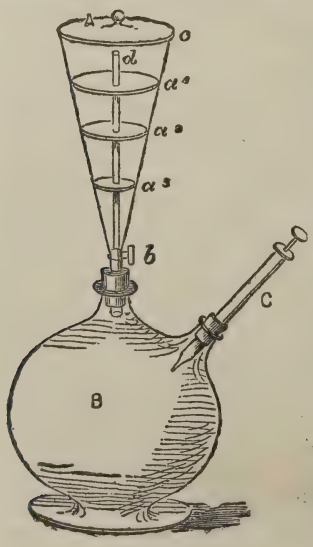
PERCHLO'RIC ACID, an energetic acid, and, when brought into contact with organic substances, exploding with great violence. It is, therefore, a dangerous substance to handle. It may be obtained by distilling potassium perchlorate with sulphuric acid. It is a colorless liquid, having a specific gravity of 1.782 at 60° Fahr., and does not freeze at — 31° Fahr. Formula, $HClO_4$. It soon becomes colored, even when kept in the dark, and after standing a few weeks decomposes with an explosion. Its vapor is transparent and colorless, and when brought in contact with moist air it forms dense white fumes. When the acid is cautiously mixed with a small quantity of water, a crystalline mass is formed, which is a monohydrate, $HClO_4 + H_2O$.

PER'CIVAL, JAMES GATES, 1795–1856; b. Conn.; graduated at Yale college, 1815, and in 1820 took a degree in medicine. He was appointed to the professorship of chemistry at West Point in 1824; in 1827 assisted Noah Webster in revising his dictionary; in 1835 was appointed assistant to Prof. Shepard in making a geological survey of Connecticut, a report of which he published in 1842; and in 1854 was made the state geologist of Wisconsin, which position he held at the time of his death. Though, as will be seen from this sketch, his scientific acquirements were considerable, his chief claim to remembrance is as a poet and literary man. His first book contained *Prometheus* and several lyric pieces (1821). *Clio* was a collection of prose and verse published in 1822 in 3 parts. Other of his poems were *The Mind; Dream of a Day and Other Poems* (1843); and many translations and minor works. A complete collection of his works was first published in Boston in 1859, with a biographical sketch by L. W. Fitch. He was very eccentric, yet a man of varied and extensive knowledge, acquainted with 10 languages, and familiar with both ancient and modern literature. His lyric poems were many of them very popular, and his other works, though now little read, are marked by a love of nature, a great variety of information, and remarkable metric skill. "One of his favorite plans was to imitate all known meters in all accessible languages, from the Sanskrit down." Although in straitened circumstances all his life, Percival collected a remarkable library. See *Life and Letters*, by Julius H. Ward (Boston, 1886).

PERCLOSE', a railing or other inclosure separating a tomb or chapel from the rest of a church.

PERCLOSE, or DEMI-GARTER, in heraldry, the lower half of a garter with the buckle.

PERCOLA'TION, a process much used in pharmacy, and in some other arts, for extracting certain soluble properties of various bodies by filtering a liquid through them.



Percolator.

In the new British pharmacopœia 39 tinctures and 9 extracts are ordered to be prepared by percolation. As the fluid soaks in and passes through the material acted upon, it displaces and carries with it the soluble parts, hence percolation is sometimes called the *method of displacement.* The forms of apparatus for percolation are very numerous, but the principle is the same in all—viz., a vessel with a porous bottom, and in the form of a truncated cone inverted, receives the material first, and over it is poured the water or other fluid which is to extract its virtues. One made by an eminent French pharmacien, M. Bejot, is very effective and complete. A is a long funnel-shaped glass, with a glass stop-cock (*b*) in the bottom, which narrows to an inch diameter; this fits into the neck of a large globular vessel B, both being adjusted by grinding. C is a syringe of brass fixed in the glass B as shown, and made air-tight by a caoutchouc washer. a^1, a^2, a^3 are three diaphragms of porous felt, pierced by the tube *d*, which allows air bubbles to escape from the bottom without disturbing the fluid. The material to be acted upon, as wood, bark, root, leaves, etc., is first powdered, and is then laid on the top of the uppermost diaphragm, a^1, so as to half fill the space between it and the glass-cover *c;* water, or any other required fluid, is then poured in until it is filled, the stop-cock *b* is opened, and the operator draws the air from the outer vessel by means of the air-pump C, the fluid is thus rapidly drawn through the material, and displaces its soluble parts. a^2 and a^3 arrest

the fine solid particles which are carried through the first diaphragm with the liquid, and form sediments which are also acted upon by the liquid which is checked at each division for a time. The fluid, when it reaches the globular glass, however dark colored, is beautifully bright and clear, and the preparations so made are remarkable for their good quality and uniformity of strength. In the year 1864 Dr. Redwood, of the pharmaceutical institution of Great Britain, invented a new percolator of great efficacy. It consists of a tinned copper cylinder, with a smaller cylinder of flannel inside, in which the materials are put. The whole is filled with the fluid menstruum, and as that which is in more immediate contact with the solid materials becomes charged with the soluble matter displaced, it gives rise, as its density is increased, to an endosmotic action through the flannel walls of the inner cylinder until the whole is equalized, when it is drawn off by the tap, and fresh fluid added until it comes away colorless. The outer cylinder has a tight cover to prevent loss by evaporation.

PERCOPSIDÆ, a family of fishes inhabiting the great lakes of North America, represented by only one genus, *percopsis*, of which there are several species, *P. pellucidus* being the most important. Their general form is trout-like, and they have been mistaken for young salmon. Scales comb-like, lateral line well defined and nearly straight, mouth small, with lateral cleft; margin of upper jaw formed by intermaxillary bones alone; no teeth on the palate; branchial openings large; branchiostegal rays six. There is one true dorsal fin, with branched rays, and an adipose fin as in *salmonidæ*.

PERCUSSION, in medicine, is the method of eliciting sounds by tapping, or gently striking the surface of the body; its object being to determine by the nature of the sound the comparative density of the subjacent parts. This means of diagnosis was first employed by Avenbrugger in the middle of last century, and it was afterwards adopted by Corvisart in the investigation of heart diseases; but its value was not fully appreciated till Laennec made the diseases of the chest his peculiar study; and since his time its application and various uses have been considerably extended by the labors of Piorry, Hughes Bennett, and other physicians.

Percussion is chiefly employed in the diagnosis of diseases of the lungs, heart, and abdominal organs. It may be *direct* (or, as some writers term it, *immediate*), or it may be *mediate*. In the former case, the part to be examined is struck with the ends of the three first fingers set close together on the same level, or with a small hammer tipped with India rubber; while in the latter, which is now almost universally adopted, a flat body is placed upon the chest, or other part to be examined, and is then struck by the fingers or hammer. The flat intervening body is termed a *pleximeter* (from the Gr. *plexis*, a blow, and *metron*, a measure). The instrument usually sold as a pleximeter is a flat oval piece of ivory, but the left index or middle finger of the physician, with its flat surface fitted accurately to the part to be examined, acts equally well. The force of the stroke on the pleximeter—whether the stroke be made with the fingers or the hammer—must vary according as it is desired to elicit the sound from a superficial or a deep-seated part. The surface to be percussed should be exposed, or, at most, only covered with one layer of clothing; and the blow should fall perpendicularly on the pleximeter. When percussion is made over a considerable cavity filled with air—as the stomach or intestines—a hollow, drum-like, or (as it is usually termed by medical writers) a *tympanitic* sound is produced. When any part of the surface of the chest is struck below which there is a considerable depth of healthy lung-tissue, consisting of small cells filled with air, a clear sound, less loud and hollow than the tympanitic sound, and termed the *pulmonary percussion note*, depending partly on the vibrations of air in the lung-cells, and partly on the vibrations of the walls of the chest, is evolved. When the subjacent substance is solid (as the heart, liver, or spleen) or fluid (as when there is effusion into a closed sac), the sound is *dull* in proportion to the density and want of elasticity of the part struck. The first thing that must be acquired, in order to make percussion useful in the diagnosis of disease, is an accurate knowledge of the sounds, elicited from the different parts in their normal condition. When, for example, the healthy pulmonary percussion note is known, increased resonance of the walls of the chest will indicate a dilatation of the air-cells (or pulmonary emphysema), while various degrees of dullness will afford evidence of such morbid changes as the effusion of fluid into the pleura (hydrothorax), or inflammatory solidification of the lung-tissue (the hepatization of pneumonia), or tubercular deposition. The use of percussion in relation to diagnosis is further shown in the articles PERICARDITIS and PLEURISY.

PERCUSSION, CENTER OF. See CENTER OF PERCUSSION.

PERCUSSION-CAPS are small copper cylinders, closed at one end, for conveniently holding the detonating powder which is exploded by the act of percussion in percussion-arms. Caps were not used with the earliest percussion-arms, which the Rev. Mr. Forsyth of Belhelvie, Aberdeenshire, patented in 1807; but they became tolerably general between 1820 and 1830, and were adopted for the army by 1840. With the adoption of breech-loading arms, the use of *separate* caps has been discontinued. Tha cap now forms a part of the cartridge, and at one operation is placed with it in the opened breech of the gun. The manufacture is extremely simple: A sheet of thin copper is stamped into pieces of appropriate shape, which are bent into the form of caps by stamping-apparatus closing round a mandril, the whole being done in one machine by two opera-

tions. The caps are then placed in a tray, mouths upward; and the inside of each is touched with a strongly adhesive varnish. Over this is dusted the detonating powder, all the particles which fail to adhere being blown, dusted, or shaken out. A stamper once more is forced into the cap, to fix and compress the powder, and the operation is completed.

For muskets, the caps are charged with equal parts of fulminating mercury and chlorate of potash; for cannon, with a mixture composed of two parts of chlorate of potash, two parts of native sulphuret of antimony, and one of powdered glass; the last ingredient taking no part in the chemical action, and being added merely to increase the friction. For the manner in which a cap is used. See Lock.

PERCY. This is the name of a noble Norman family who accompanied the conqueror to England, and whose head, William de Percy, obtained from his sovereign thirty knight's fees in the n. of England. The representation of the house devolved (temp. Henry I.) on Agnes, daughter of the 3d baron, who married Josceline of Lovain, brother-in-law of the king, only on condition that he adopted either the surname or the arms of Percy; he chose to retain his paternal arms and to assume the Percy name. The head of the family at the time was one of the chief barons who extorted Magna Charta from king John; and the 9th feudal lord (temp. Edward I.) showed a similar spirit towards the pope, against whose demands he maintained, with others of the greater barons, the spiritual independence of the English crown. This nobleman's great-grandson was a distinguished military commander under Edward III., and, acting as marshal of England at the coronation of Richard II., was created earl of Northumberland. He subsequently, however, took up arms against Richard, and placed the crown on the head of Henry of Lancaster, who became Henry IV. Again dissatisfied with the government, he joined in rebellion with his son Hotspur, for the purpose of transferring the crown to Mortimer, earl of March. The earl, with the other leaders of this rebellion, fell at Bramham Moor (1407–08), and his titles became forfeited. These, however, were revived in favor of his grandson, who became lord high constable of England, and who was killed at the battle of St. Alban's. This earl's son and successor (the third earl) met a like fate on Towton field, fighting in the van of the Lancastrian army. The 4th earl (who obtained a reversal of his father's attainder) was murdered by the populace in Northumberland, when ordered by the avarice of Henry VII. to enforce a subsidy. The executions of the 6th and 7th earls by Edward VI. and Elizabeth are part of the history of England. The 8th earl was committed to the tower, on a charge of being concerned in a plot in favor of Mary queen of Scots, and died a violent death in prison. The 10th earl fought in the civil wars against Charles I., though he took no part with the regicides, and eventually joined in the general effort to bring about the restoration. The 11th earl left an only child, who succeeded to the ancient barony of Percy, and marrying Charles, duke of Somerset, became the mother of Algernon, duke of Somerset, who was created earl of Northumberland, with remainder to his son-in-law, sir Hugh Smithson, of Stanwick, in the county of York, a gentleman of respectable lineage. Sir Hugh, succeeding to the earldom, obtained in 1766 his advancement to the dukedom of Northumberland, which title is now held by Algernon-George Percy, born in 1810, who succeeded to the dukedom in 1867.

PERCY, Thomas, d.d., an eminent poetical collector, antiquary, and scholar, was b. at Bridgenorth, Shropshire, in 1728; was educated at Christchurch, Oxford; and having entered the church, rose to be bishop of Dromore, in Ireland, 1782. He died in 1811. This amiable and accomplished prelate, the friend of Johnson, Goldsmith, and other distinguished contemporaries, published translations from the Icelandic, a new version of the *Song of Solomon*, the *Northumberland Household Book*, a translation of Mallet's *Northern Antiquities*, etc. His most popular and valuable contribution to our literature was the *Reliques of Ancient English Poetry*, consisting of old heroic ballads and songs, with some modern imitations, in which the editor himself displayed the taste and feeling of a poet. This work appeared in 1765, and Percy lived to see four editions of it called for by the public, and to receive the warm commendations of all poetical readers and critics. The *Reliques* were chiefly obtained from an old folio MS. that had fallen into Percy's hands, with the addition of pieces from the Pepys collection at Cambridge, the Ashmole library at Oxford, the British museum, and the works of our earlier poets. Certain liberties were taken with some of the ballads—softening touches, repairs, and renovations—for which the editor was severely censured by Ritson and other antiquaries; but the collection was of great value to English literature, recalling public taste to the rude energy, picturesqueness, and passion of the old chivalrous minstrels and Elizabethan songsters. It captivated the youthful imagination of Walter Scott, and was the inspirer and model of his *Minstrelsy of the Scottish Border*. The memory of Percy has been still further perpetuated by a club book association, called the Percy Society. See Club.

PERDIC'CAS, son of Orontes; a general of Alexander the Great. He commanded a division of the phalanx at the most important victories of Alexander; at Susa was given a crown of gold and the hand of the Median satrap's daughter, and at the great conqueror's death-bed received from him his signet-ring, and therefore claimed the protectorship of the empire. When Aridæus, the natural son of Philip, was recognized as king,

Perdiccas became the general of the household troops and gained full control of the government. He joined the party of Roxana, one of Alexander's wives, and put to death Statira, the other. A confederation against the power of Perdiccas was entered into by Antigonus, Antipater, and Ptolemy, and in B.C. 321 he was assassinated near Memphis by his own soldiers.

PERDI'DO, a bay and river of Alabama. The bay, 20 m. long by 6 to 10 m. wide, opens by a narrow channel into the gulf of Mexico, 18 m. w. of the entrance to Pensacola bay; the river rises in s.w. Alabama, and bay and river form the boundary between Alabama and Florida.

PERE DUCHESNE. See HÉBERT, JACQUES RENÉ.

PER'EGRINE FALCON, *Falco peregrinus*, a species of falcon (q.v.) found in almost all parts of the world. The female is larger than the male, being about 18 in. in length from the tip of the bill to the tip of the tail, whilst the male is only about 15 inches. The female is the *falcon* of falconers, and the male the *tercel*. The plumage of the two sexes is very similar. The back, wings, and tail are bluish-slate or ash-gray, the feathers barred with a darker tint; the crown of the head, back of the neck, and a spot below the eye, nearly black; the front of the neck white, with dark longitudinal lines; the breast, belly, and plumage of the legs, whitish, with dark-brown transverse bars. The wings are very long, reaching almost to the tip of the tail; and the bird is remarkable for its power of flight, being capable of maintaining for a considerable time a rate of more than 100 miles an hour, so that it is often seen far from any of its haunts or breeding-places; whence the name peregrine, from the Latin *peregrinus*, a wanderer. Its swoop, when rushing on its quarry, is wonderful both for rapidity and force. The peregrine falcon can easily carry through the air a bird or quadruped fully its own weight. Its ordinary prey consists of grouse, woodcocks, rabbits, etc. The woodcock in vain seeks to escape from it by threading its way among branches of trees and brushwood; the falcon follows, and exhibits at least an equal power of moving with great rapidity in the thicket without getting entangled or stayed. Sometimes the quarry soars into the air, and seeks safety by trying to keep above the falcon, till both are lost to ordinary sight; but the falcon generally gets uppermost, and "strikes" it at last. Owing to the quantity of game the peregrine falcon will capture—it is said that a single nest will consume nearly 300 brace of grouse in a season, besides other prey—it is ruthlessly trapped or otherwise destroyed, so that this beautiful bird is in danger, like others of its family, of being exterminated. The peregrine falcon is a bird as remarkable for boldness as for power of flight. It has sometimes been seen to pounce on game shot by a sportsman, before it could fall to the ground; and an instance occurred in Yorkshire of a peregrine falcon dashing through the glass of an aviary in a town, and carrying off a bird. It makes its nest on ledges of high rocks, either on the sea coast or in inland precipices and ravines, and lays from two to four eggs. Numerous localities in Britain have long been noted as breeding-places of the peregrine falcon, and some of them are regularly visited for the young birds, which are still trained in certain places for the sport of falconry. The bird, caught when adult, although more difficult to train, is, however, believed to possess superior qualities. The peregrine falcon is more docile, and becomes more gentle than the gyr-falcon. The young female of the peregrine falcon has been by mistake described by Pennant and others under the name of the lanner, a species not found in Britain.

PEREIRA, JONATHAN, the pharmacologist, was b. in the parish of Shoreditch, London, May 22, 1804. After a distinguished career at a classical academy in Finsbury, where he remained for four years, he devoted himself to the study of medicine, and in 1823 was appointed resident medical officer of the general dispensary in Aldersgate street, at which institution he became, three years afterward, lecturer on chemistry. His attention was early attracted to the study in which he has become famous. In 1824, he published a translation of the *London Pharmacopœia;* which was followed by *A Manual for the Use of Students; A General Table of Atomic Numbers, with an Introduction to the Atomic Theory;* and other text-books for the use of those who were preparing for medical examinations. He contributed numerous papers to the professional journals on the properties and adulteration of drugs, and laid the foundation of those researches which issued in his great work on *Materia Medica*. In 1832 he resigned the office of lecturer for that of professor of materia medica in the new medical school in Aldersgate street, and at the same time he succeeded Dr. Gordon as lecturer on chemistry at the London hospital. His *Elements of Materia Medica* (first published in the form of lectures contributed to the *Medical Times and Gazette*) appeared as a separate work in 1839–40, and at once established his reputation as a pharmacologist. The treatise is remarkable for the extent of its research, the variety of its information, whether scientific, commercial, or practical, and the scrupulous exactness of its statements. In 1841, he procured the license to practice in London from the college of physicians; in 1845 he was elected a fellow of that body; and on the establishment of the London university he was appointed examiner in materia medica and pharmacy, a post which he filled with admirable efficiency till his death. Among his other contributions to science, the best known are his excellent treatises on *Diet* and on *Polarized Light*, both of which appeared in 1843. His death, which took place on Jan. 20, 1853, was the result of a fall down a

flight of steps in the college of surgeons, and was deeply felt, not only by his professional brethren, but by the numerous scientific bodies, such as the Royal, the Linnæan, and the other societies of which he was a distinguished fellow.

PÉREIRE, Emile, and Isaac, sons of Jacob Rodriquez, an Israelite distinguished for having instituted deaf and dumb schools in France; b. respectively in 1800 and 1806 in Bordeaux. Émile began life as a co-laborer with Armand Carrel upon the *Globe* and *National* of Paris, and was an enthusiastic St. Simonite. In 1832 he projected the first railroad in France, from Paris to St. Germain, and succeeded in getting the capital to undertake its construction. The brothers soon obtained the contract for building the railroad of the north, and in this, and subsequent railroad work, realized great fortunes. In 1852, in connection with the Rothschilds, they conceived and established the *Société générale du crédit mobilier* with a nominal capital of 60,000,000 francs. Its operation became enormous in a short time, stimulated every kind of business, and encouraged vast speculations. Though not a bank of issue, it so manipulated the rapid exchange of capital as to give the effect of a vast increase of money in circulation. After becoming the center of enormous operations, not only in France, but as a medium of loans throughout Europe, it collapsed in 1867, and absorbed in its liquidation a part of the enormous fortunes made by the brothers Péreire in its management. Émile was the virtual head of the projects of the brothers, and Isaac the executive hand. The latter is author of a pamphlet entitled *Rôle de la Banque de France et l'organizeation du credit en France,* and others, financial and religious. Émile died in Paris in 1875, and Isaac in 1880.

PEREJASSLAVL', an ancient t. of Russia, in the gov. of Poltava, 100 m. s. of Tchernigov, at the confluence of the Trubesh and Alta, near the Dneiper. A battle was fought here in 1149.

PEREKOP, Isthmus of, in south Russia, gov. of Taurida, 18 m. long, 16 m. broad at its southern, and 5 m. broad at its northern extremity, connects the peninsula of the Crimea with the mainland of European Russia. It is an arid waste of mere sand, or sand combined with clay. There are, however, numerous salt lakes, and salt is extensively made. In the n. of the isthmus, and forming the key to the Crimea, is the small t. of Perekop. Notwithstanding its advantageous position at the convergence of the numerous roads leading from South Russia into the Crimea, Perekop is of little commercial importance. Pop. of town, '91, 1574.

PÈRE-LA-CHAISE. See La-Chaise.

PEREMPTORY DEFENSES, in Scotch law, mean defenses to an action or suit, which amount to an entire negative of the right of action, as distinguished from a preliminary or temporary defense.

PEREN'NIAL, in botany, a term employed in contradistinction to annual (q.v.) and biennial (q.v.) to designate plants which subsist for a number of years. Some plants, however, which are annual in cold climates, are perennial in warmer regions. The term perennial is in general applied only to herbaceous plants, and indicates a property only of their roots, the stems of most of them dying at the end of each summer. Perennial herbaceous plants, like shrubs and trees, are capable of producing flowers and fruit time after time, in which they differ from annual and biennial plants, which are fruitful only once. Those plants which are capable of being propagated by cloves, offset bulbs, or tubers, are all perennial. Thus the potato is a perennial plant, although the crop is planted in spring and reaped in autumn, like that of corn, whilst all the corn plants are annuals.—There is a great diversity in the duration of life of perennial plants.

PERESLAV', or Pereiasla'vle-zalie'sky, a district t. in the middle of great Russia, in the gov. of Vladimir, and 70 m. n.w. of the city of that name. It was founded in 1052 by George, prince of Sousdal. It possesses numerous churches and religious institutions; but is principally noteworthy for the factories, which are its main prop, and of which the most important are cotton-mills and print-works for cotton goods. The factories are in an increasingly prosperous condition. The cotton manufactures of Pereslav are exported to the fairs of Nijni-Novgorod and Irbit, and even to China by way of Siberia. Pop. 13,600, employed in the factories and in the productive fishery of lake Pleshtcheieff.

PEREZ, Antonio, Minister of Philip II. of Spain, was born in Aragon in 1541. His father was secretary of state under Charles I. and Philip II., and he himself was appointed to this office when only 25 years of age, and acquired the entire confidence of the king. Don Juan d'Austria, having sent his confidant, Juan de Escovedo, to Spain, to solicit aid against the party of Orange; and Escovedo having rendered himself an object of hatred both to the king and to Perez, the former resolved to put him out of the way by murder, and intrusted Perez with the accomplishment of this design, which Perez, to gratify his own revenge, accomplished accordingly, Mar. 31, 1578. The family of Escovedo denounced Perez as the murderer, and all his enemies joined against him. The king at first sought to shield him; but in July, 1581, he was arrested, and by torture forced to confess. He succeeded, however, in making his escape to Aragon, were he put himself under protection of its laws. After a long and severe inquiry into his conduct, he was found guilty of many acts of fraud and corruption, and condemned to death in Madrid; but the *justicia major,* or highest court of justice in Saragossa, refused

to deliver him up. The king applied for aid in May, 1591, to the inquisition, and the Aragonese court delivered him up to its agents, but the people rose in tumult, and liberated him. This happened repeatedly; and at last, in Sep., 1591, Philip II. entered Aragon with an army powerful enough to subdue all opposition, abolished the old constitutional privileges of the country, and caused a number of the principal people to be executed. Perez, however, made his escape, avoiding the many plots which the king laid for his assassination. He was condemned in Spain as a heretic, but was treated with great kindness in Paris and London. He spent the latter years of his life in Paris, and died there in 1611 in great poverty. Perez wrote an account of his misfortunes, which was published at Paris in 1598, under the title of *Relaciones.*

PERFECTIBIL'ITY OF CHRISTIANS, a doctrine held by the Wesleyan Methodists (see METHODISTS) of a *Christian perfection* attainable in this life. It is not a perfection of *justification*, but a perfection of *sanctification;* which John Wesley, in a sermon on Christian perfection, from the text Heb. vi. 1, "Let us go on to perfection," earnestly contends for as attainable in this life by believers, by arguments founded chiefly on the commandments and promises of Scripture concerning sanctification; guarding his doctrine, however, by saying that it is neither an *angelic* nor an *Adamic* perfection, and does not exclude ignorance and error of judgment, with consequent wrong affections, such as "needless fear or ill-grounded hope, unreasonable love, or unreasonable aversion." He admits, also, that even in this sense it is a rare attainment, but asserts that "several persons have enjoyed this blessing, without interruption, for many years, several enjoy it at this day, and not a few have enjoyed it unto their death, as they have declared with their latest breath, calmly witnessing that God had saved them from all sin, till their spirit returned to God." Concerning all which, the general belief of Protestant Christians is, that these persons were merely more self-complacent and less sensible of their own corruptions than is usual, and that the commands and promises concerning sanctification are all susceptible of an explanation consistent with remaining corruption in believers, and a need of further sanctification, or a continued going on unto perfection whilst this life endures.

That perfection is attainable in this life is held by the Franciscans, Jesuits, and Molinists in the church of Rome, but denied by the Dominicans and Jansenists. In advocating the doctrine, its Roman Catholic supporters generally rest much on the distinction between mortal and venal sins.

PERFE'CTIONISTS, or BIBLE COMMUNISTS, popularly known as FREE-LOVERS, or preachers of free love, a small American sect who are equally remarkable for the doctrines which they hold, and for the unfaltering way in which they carry them out in practice. The founder of the sect was John Humphrey Noyes (q.v.). He was well described by William Hepworth Dixon, in his work on *New America*, as "a tall, pale man, with sandy hair and beard, gray dreamy eyes, good mouth, white temples, and a noble forehead." In appearance he was a little like Mr. Carlyle, and is said to have been not a little proud of the resemblance. Noyes was born at the town of Brattleborough in Vermont; he studied at Dartmouth college, N. H., where he took a degree; and he afterward became a clerk in a lawyer's office at Chesterfield. In 1831 a revival of religion broke out at Putney, and Noyes was one of those who were aroused to a consciousness of sin and anxiety about the way of salvation. He began to puzzle over theological questions; and he gave up the law to study theology at Andover, in Massachusetts. There he spent a year in unremitting study of the Bible; but was exposed to many temptations, owing to the habits prevailing among his fellow students. From Andover he passed to Yale college, New Haven, where he was first a student, afterwards a preacher in connection with the Congregational body, and where he became a great seeker after truth—not as it stands between God and man only, but as between man and man. Here it was that he arrived at the principal of the ideas which constitute his social and religious system—deriving them, after much study and speculation, from the writings of St. Paul. He came to the conclusion that the opinions of St. Paul had been completely misconceived by all the Christian churches; that all our ecclesiastical organizations have consequently been blunders; and that from the apostolic age to his own there had been no visible church of Christ upon earth. He conceived that in the age of Paul and Peter there had been a true Christian church—a communion of saints, in which all were brethren, and all equals; but that it passed away at an early date, on our Lord having returned in the spirit, as he had promised, to dwell among his people forever. This second advent of Christ he placed in the year 70; and he came to the conclusion that since then the true church has consisted, not of any of the religious organizations which have successively sprung up, but of saintly persons scattered here and there, sinless in body and soul, confessing Christ as their lord, professing holiness, rejecting law and usage, and submitting their passions to the divine will. He believed that Christ, on his second advent, abolished the old law, and closed the reign of sin which began with Adam; and that he has thenceforth set up his kingdom in the hearts of all willing to accept his reign. For such persons there was no longer any law or rule of duty; neither the Mosaic code, nor the sermon on the mount, nor the ordinances or institutions of civil society were binding upon them; they were a law unto themselves; they were free to do as they pleased, but—with exceptions which, however, could not invalidate an eternal

truth—under the influence of the divine spirit which dwelt in them, they could only do that which was right. It was owing to the power of the devil that the churches had gone so far astray; but he conceived that the time had come when, among the new communities of America, there should be set up a perfect model of a Christian church—in which all should be brethren; in which men and women should be equals; in which individuals should be untrammeled by any restraints save those imposed by the divine spirit working within themselves. Noyes took upon himself the task of laying the foundations of the true Christian church; but before setting to the work, he is accused of having furnished at once evidence of his belief in his theory, and an illustration of the dangers attending it in practice. His mind once satisfied that there was no law for him, he gave the rein, it is said, to dissipation, and for some time abandoned himself to licentiousness. This, however, is denied as a malicious calumny.

His early efforts at establishing a church, made at New Haven, were very discouraging; he made converts to his views, and they became only too deeply imbued with his theory. Each being a law unto himself, they had conflicting desires, and this led to quarreling, and eventually to schism. Among the men, there were some who contested with Noyes the leadership of the fraternity; and among the women, one or two who, in spite of his theory, expected him to marry them. At the end of four years, he found, that though he had co-believers, he had no followers; and he retired to Putney, disappointed, but resolved to make a new experiment. He determined to make trial of the principle of association—of association under conditions which he deduced from the New Testament; to establish a "Bible family"—a society disavowing all law and all connection with the world, in which all should be brethren, perfectly equal; in which, therefore, worldly goods should be held in common; in which there should be no appropriation of men and women to one another. The connection of the sexes was, upon his view, as free from law, as completely subject to the desires of individuals, as every other human relation; and besides, he seems to have thought a community of women a logical sequence from a community of goods. He saw that the members of such a society must be selected and educated for it; and he set up a Bible class, by means of which he gained a sufficient number of proselytes, and educated them for Bible association. Before long, there was nothing wanting for a trial of his scheme but money to buy a house and a piece of land; and this he got by marrying one of his converts, a young lady named Harriet Holton, to whom it is but fair to say, he candidly explained that with his principles marriage could be nothing but a form. Then he and his associates formally renounced their allegiance to the United States, and set up house in "celestial order" at Putney. His wife, mother, sister, and brother were among the members of the new society; the others were all persons of some means and position—preachers, farmers, doctors, with their wives and children. Their property was thrown into a common stock; they gave up the use of prayer, all religious service, and the observance of the Sabbath; those who were married renounced their marriage ties, and a "complex marriage" was established between all the males and all the females of the "family." To get rid of the inconveniences which had been found attendant upon the exercise of Christian liberty, Noyes had set up a new principle, viz., sympathy, by which the individual will was to be corrected, which practically imposed upon individuals the duty of deferring to the feelings and opinions of the brethren. He now taught that the family was wiser than the individual, who *might* stray from the path of grace; that the individual was erring when he differed from the family; and that the inclinations of individuals must be submitted to the opinion of the family. Having dispensed with law, he set up public opinion as a controlling power in its stead; and free criticism of one another by the members of the society became an important feature of his system. Quarreling, however, broke out among the members; their differences were brought before the law-courts; and when the details of the family system became known, the people of Putney made the place too hot for the Perfectionists. Their establishment was broken up; but a portion of the Putney family—about fifty men, as many women, and about the same number of children—soon established themselves in a new home, in the sequestered district of Oneida, in the state of New York. Among the things which first drew attention to the Putney family was a controversy which Noyes maintained with the leaders of another society of Perfectionists established at Oberlin. The Perfectionists were divided upon the question, whether of the two leading features of their system, the profession of holiness and the right of Christian liberty, the one or the other was the more important—some were "liberty-men," others "holiness-men." Noyes took up the controversy on behalf of the latter.

At Oneida creek, the new "family" purchased about 600 acres of forest-land, and proceeded to bring it under cultivation. They have made it one of the most productive estates in the union; they have also established manufactures of various kinds; and in the course of 30 years, they have become a prosperous, and even a wealthy community. Their wealth they owe in a great measure to the inventive talent of one of the "family," an old Canadian trapper, named Sewell Newhouse, who invented an improved form of trap—the "Oneida trap"—which is now almost universally used by trappers throughout America. In other respects, the "family" has been very prosperous: it consisted in the year 1874 of in all 238 persons, who lived together in a state of great harmony and contentedness; and being already sufficiently numerous, it had to reject frequent applications

which were made for admission to membership. (A small society was established at Wallingford, Conn.; which became a joint-stock company, 1881.) Their neighbors soon became accustomed to the Perfectionists and their ways, and let them live in peace; Noyes even became popular. On settling at Oneida, guided by his experience, he modified many of the details of his arrangements. Between study and labor, the life of the "family" at Putney had been rather a hard one—he told his followers that in future they should enjoy life as became men to whom all things were pure and permitted. The society chose no chiefs, believing that, without chiefship, the management of their affairs must fall to the fittest persons; and their affairs have been ably managed. The controlling function of criticism was strengthened by being made more systematic; and a regard for the common good, grown strong through habit, has made persons who disavow all laws perfectly submissive to the unwritten laws of public opinion. In the smallest, as well as in important affairs, the Perfectionist practices submission to the opinion of his brethren: in small matters, he usually gathers it by consultation with some of the older members of the body; important ones are submitted to the "family" at their evening meetings. All are busy; and they work as hard for the general interest as men do in the hope of enriching themselves. The men wear no particular garb, but usually dress like the country-people around them; the women have their hair cut short, and parted down the center; abjure stays and crinoline; wear a tunic, falling to the knee, and trousers of the same material; a vest, buttoning high toward the throat; and a straw hat. In this costume, according to Mr. Hepworth Dixon, plain women escape notice, and pretty girls look winsome; but, as may be inferred from the treatment of their hair, it has been no part of the Perfectionist system to make the women look bewitching. The "family" has breakfast at six o'clock, dinner at twelve, and the evening-meal at six in the afternoon; the more advanced of its members abstain from animal food; they drink no beer, and only a weak home-made wine; and like most of the new American sects, they will have nothing to do with doctors. The women are allowed a good deal of influence.

Up to 1879 the men and women were united by a "complex marriage," but their intercourse—which, in theory, was unfettered by any law—was, in practice, subject to a good deal of regulation. Like everything else, it has become subject to the opinion of the society, and certain principles had been so steadily applied to it that they had gained the force of laws. First, there was the principle of the ascending fellowship. There should be contrast, the Perfectionists said, between those who became united in love. That there should be difference of temperament and of complexion had, they said, been well ascertained by physiologists. They held that there should be a difference in age also, so that the young and passionate might be united to those who had, by experience, gained self-control. In virtue of this principle, the younger women fell to the older men, and the younger men to the older women. A second principle was that there should be no exclusive attachment between individuals; a third, that persons should not be obliged to receive the attentions of those whom they did not like; and, lastly, it was held indispensable that connections should be formed through the agency of a third party—because, without this, the question of their propriety might be withdrawn from criticism, and also because this afforded a lady an easy opportunity of declining. The human heart, the Perfectionists said, is capable of loving any number of times, and any number of persons at the same time, and the more it loves the more it can love. The system of the "complex marriage" was therefore suitable to, while monogamy imposed a restriction upon, human nature; and they believed that marriage would be spurned by the churches as soon as they got rid of the false notion of the essential sinfulness of love. They are confident that, when they have worked out a few details still incomplete, their system will be perfect, and that it will, before long, be imitated throughout the length and breadth of America. There are four things, according to Noyes, necessary to the organization of a true family: (1) The reconciliation of its members with God; (2) their salvation from sin; (3) recognition of the brotherhood and equality of man and woman; (4) community of labor and its fruits; and communism can only prosper when the previous conditions exist. The Perfectionists hold that for reconciliation to God and salvation from sin nothing is necessary but faith; let a man believe that he is reconciled to God, and his sins are immediately washed away. See Oneida Community.

PERFORMANCE OF CONTRACTS is one of the modes of satisfying the contract, which may be either by doing some specific thing, or not doing something, or by payment of money. It is a good answer to any action brought by one party against another for breach of contract, that what was contracted for has been already performed.

PERFUMERY—PERFUMES (Fr. *perfum*, from Lat. *fumus*, smoke or vapor), delicate fumes or smells. Perfumes are of three distinct classes when derived from plants, and there is a fourth class which are of animal origin.

Class I.—These are the most ancient, and have been in use from the earliest period of which there is record. They consist of the various odiferous gum-resins, which exude naturally from the trees which yield them; and to increase the produce, the plants are often purposely wounded. The most important are benzoin, olibanum, myrrh, and camphor. No less than 5000 cwt. of these together are annually imported into America. Gum-resins form the chief ingredients in "incense" (q.v.), and in pastilles (q.v.).

Class II. are those perfumes which are procured by distillation. As soon as the Greeks and the Romans learned the use of the still, which was an invention imported by them from Egypt, they quickly adapted it to the separation of the odorous principle from the numerous fragrance-bearing plants which are indigenous to Greece and Italy. An essential oil or otto thus procured from orange-flowers bears in commerce to this day the name of neroly, supposed to be so named after the emperor Nero. Long before that time, however, fragrant waters were in use in Arabia. Odor-bearing plants contain the fragrant principle in minute glands or sacs; these are found sometimes in the rind of the fruit, as the lemon and orange; in others it is in the leaves, as sage, mint, and thyme; in wood, as rosewood and sandal-wood; in the bark, as cassia and cinnamon; in seeds, as caraway and nutmeg. These glands or bags of fragrance may be plainly seen in a thin-cut stratum of orange peel; so also in a bay leaf, if it be held up to the sunlight, all the oil cells may be seen like specks, All these fragrant-bearing substances yield by distillation an essential oil peculiar to each; thus is procured oil of patchouly from the leaves of the patchouly plant, *Pogostemon patchouly*, a native of Burmah; oil of caraway, from the caraway seed; oil of geranium, from the leaves of the *geranium rosa*; oil of lemon, from lemon peel; and a hundred of others of more infinite variety.

The old name for these pure odiferous principles was quintessence. Latterly, they have been termed essential oils; they are now, in modern scientiffc works, often termed ottos, from the Turkish word attar, which is applied to the well-known otto or attar of roses. See Oil.

All the various essential oils or ottos are very slightly soluble in water, so that in the process of distillation the water which comes over is always fragrant. Thus, elder water, rose water, orange water, dill water are, as it were, the residue of the distillation for obtaining the several ottos. The process of distillation (q.v.) is very simple; the fragrant part of the plant is put into the still and covered with water; and when the water is made to boil the ottos rise along with the steam, are condensed with it in the pipe, and remain floating on the water, from which they are easily separated by decanting. In this way 100 lbs. of orange, lemon, or bergamot fruit peel will yield about 10 oz. of the fragrant oil; 100 lbs. of cedar-wood will give about 15 oz. of oil of cedar; 100 lbs. of nutmeg will yield 60 to 70 oz. of oil of nutmeg; 100 lbs. of geranium leaves will yield 2 oz. of oil.

Every fragrant substance varies in yield of essential oil. The variety of essential oils is endless; but there is a certain relationship among odors as among tints. The lemon-like odors are the most numerous, such as verbena, lemon, bergamot, orange, citron, citronella; then the almond-like odors, such as heliotrope, vanilla, violet; then spice odors—cloves, cinnamon, cassia. The whole may be classified into 12 well-defined groups. All these ottos are very soluble in alcohol, in fat, butter, and fixed oils. They also mix with soap, snuff, starch, sugar, chalk, and other bodies, to which they impart their fragrance.

The principal consumption of the various fragrant ottos is for scenting soap. Windsor soap, almond soap, rose soap, and a great variety of others, consist of various soaps made of oil and tallow, perfumed while in a melted state with the several named ottos or mixtures of them.

Though snuff is by no means so popular an article in the nineteenth century as it was in the eighteenth, yet the increased population, and the extended exports to colonies, cause a production of scented snuff positively greater now than 50 years ago; and it is especially in demand in the fur countries of northern Canada. There is a large consumption of fragrant essential oils in the manufacture of toilet powders; under the various names of rose powder, violet powder, etc., a mixture of starch and orris, differently scented, is in general demand for drying the skin of infants after the bath.

Precipitated chalk and powdered cuttle-fish bone, being perfumed with otto of roses, powdered myrrh, and camphor, become "dentifrice." The ottos of peppermint, lavender, rose, and others, are extensively used in scenting sweetmeats and lozenges.

More than 200,000 pounds-weight of various ottos have been imported into Britain in one year, and valued at over $900,000; to this must be added at least one-third as much again distilled in England. Of the imported articles enumerated, oils of lemon and bergamot, from the Two Sicilies, reached 128,809 lbs., valued at $300,000.

Class III.—These are the perfumes proper, such as are used for perfuming handkerchiefs, etc. Contrary to the general belief, nearly all the perfumes derived from flowers are not made by distillation, but by the processes of *enfleurage* and *maceration*. Although this mode of obtaining the odors from flowers has certainly been in practice for two centuries in the valley of the Var, in the s. of France, it is only by the publication of a recent work* that the method has been made generally known. The odors of flowers do not, as a general rule, exist in them as a store or in a gland, but are developed as an exhalation. While the flower breathes it yields fragrance, but kill the flower, and fragrance ceases. It has not been ascertained when the discovery was made of condensing, as it were, the breath of the flower during life; what we know now is that if a living flower be placed near to grease, animal fat, butter, or oil, these bodies absorb the odor given off by the blossom, and in turn themselves become fragrant. If we spread fresh

* *Art of Perfumery*, by Septimus Piesse, PH.D., 8vo. 50 cuts. Longman.

unsalted butter upon the bottom of two dessert-plates, and then fill one of the plates with gathered fragrant blossoms of clematis, covering them over with the second greased plate, we shall find that after 24 hours the grease has become fragrant. The blossoms, though separated from the parent stem, do not die for some time, but live and exhale odor, which is absorbed by the fat. To remove the odor from the fat, the fat must be scraped off the plates and put into alcohol; the odor then leaves the grease and enters into the spirit, which thus becomes "scent," and the grease again becomes odorless.

The flower farmers of the Var follow precisely this method on a very large scale, with but a little practical variation, with the following flowers: rose, orange, acacia, violet, jasmine, tuberose, and jonquil. The process is termed *enfleurage.* In the valley of the Var there are acres of jasmine, of tuberose, of violets, and the other flowers named; in due season the air is laden with fragrance, the flower harvest is at hand. Women and children gather the blossoms, which they place in little panniers like fishermen's baskets hung over the shoulders. They are then carried to the laboratory of flowers and weighed. In the laboratory the harvest of flowers has been anticipated. During the previous winter great quantities of grease, lard, and beef-suet have been collected, melted, washed, and clarified. In each laboratory there are several thousand *châssis* (sashes), or framed glasses, upon which the grease to be scented is spread, and upon this grease the blossoms are sprinkled or laid. The *châsse en verre* is, in fact, a frame with a glass in it as near as possible like a window-sash, only that the frame is two inches thicker, so that when one châsse is placed on another, there is a space of four inches between every two glasses, thus allowing space for blossoms. The flower blossoms are changed every day, or every other day, as is convenient in regard to the general work of the laboratory or flowering of the plants. The same grease, however, remains in the châsse so long as the particular plant being used yields blossoms. Each time the fresh flowers are put on, the grease is "worked"—that is, serrated with a knife—so as to offer a fresh surface of grease to absorb odor. The grease being *enfleurée* in this way for three weeks or more—in fact, so long as the plants produce blossoms—is at last scraped off the châsse, melted, strained, and poured into tin canisters, and is now fit for exportation. Fat or oil is perfumed with these same flowers by the process of maceration; that is, infusion of the flowers in oil or melted fat. For this end purified fat is melted in a *bain marie,* or warm bath, and the fresh blossoms are infused in it for several hours. Fresh flowers being procured, the spent blossoms are strained away, and new flowers added repeatedly, so long as they can be procured. The *bain marie* is used in order to prevent the grease becoming too hot from exposure to the naked fire; so long as the grease is fluid, it is warm enough. Oil does not require to be warmed, but improved results are obtained when it is slightly heated.

Jasmine and tuberose produce best perfumed grease by enfleurage, but rose, orange, and acacia give more satisfactory products by maceration; while violet and jonquil grease is best obtained by the joint processes—enfleurage followed by maceration. For enfleurage of oil a *châsse en fer* is used. In the place of glass, the space is filled with a wire net, on which is laid a *molleton,* or thick cotton fabric—moleskin soaked with oil; on this the flowers are laid, just as with solid grease. In due time—that is, after repeated changing the flowers—the oil becomes fragrant, and it is then pressed out of the moleskin cloth. Oil of jasmine, tuberose, etc., are prepared in this way. In order now to obtain the perfume of these flowers in the form used for scenting handkerchiefs, we have only to infuse the scented fat or oil, made by any of the above methods, in strong alcohol.

In extracting the odor from solid fat it has to be chopped up fine as suet is chopped, put into the spirit, and left to infuse for about a month. In the case of scented oil it has to be repeatedly agitated with the spirit. The result is that the spirit extracts all the odor, becoming itself "perfume," while the grease again becomes odorless; thus is procured the essence of jasmine, essence of orange flowers, essence of violets, and others already named, rose, tuberose, acacia, and jonquil.

It is remarkable that these flowers yield perfumes which, either separate or mixed in various proportions, are the types of nearly all flower odors; thus, when jasmine and orange flowers are blended, the scent produced is like sweet-pea; when jasmine and tuberose are mixed, the perfume is that of the hyacinth. Violet and tuberose resemble lily of the valley. All the various bouquets and nosegays, such as "frangipanni," "white roses," "sweet daphne," are made upon this principle.

The commercial importance of this branch of perfumes may be indicated by the quantity of flowers annually grown in the district of the Var. Flower harvest: orange blossoms, 1,475,000 lbs.; roses, 530,000 lbs.; jasmine, 100,000 lbs.; violets, 75,000 lbs.; acacia, 45,000 lbs.; geranium, 30,000 lbs.; tuberose, 24,000 lbs.; jonquil, 5,000 lbs.

Class IV.—Perfumes of animal origin: The principal are musk (q.v.), ambergris (q.v.), civet (q.v.), and castoreum (q.v.). The aroma of musk is the most universally admired of all perfumes; it freely imparts odor to every body with which it is in contact. Its power to impart odor is such that polished steel will become fragrant of it if the metal be shut in a box where there is musk, contact not being necessary.

In perfumery manufacture, musk is mixed with other odorous bodies to give permanence to a scent. The usual statement as to the length of time that musk continues to give out odor has been called in question. If fine musk be spread in thin layers upon

any surface, and fully exposed to a changing current of air, all fragrance, it is said, will be gone in from 6 to 12 months.

Civet is exceedingly potent as an odor, and when pure, and smelled at in the bulk of an ounce or so, is utterly insupportable from its nauseousness; in this respect it exceeds musk. When, however, civet is diluted so as to offer but minute quantities to the olfactories, then its perfume is generally admitted; this is so with gas-tar; but the fragrant principle is the same as that breathed by the beautiful narcissus. Castor is in our day almost obsolete as a perfume. The United States imported perfumes and cosmetics in 1881 to the value of $458,274; in 1885, to the value of $355,629; in 1890, to the value of $423,963. The falling off of the importations is due to the increased production of the higher grades of perfumery in this country.

The works on perfumes are very few; that of Mme. Celnart, in the Libraire Roret, is most worthy of notice among the French; a translation of it has been made by Mr. C. Morfit of Philadelphia. In England, *The British Perfumer*, by C. Lilly (1822), was the only work of the kind published in England prior to the *Art of Perfumery* by S. Piesse (1855). See also Rimmel's *Book of Perfumes* (1875).

PER'GAMUS, or PERGAMUM, anciently a city of Mysia in Asia Minor, on the navigable river Caïcus, at the distance of 120 stadia from the sea. According to tradition, the place was of Greek origin, but its early history is quite insignificant. It first acquired prominence when Lysimachus, one of Alexander's generals, chose it as a stronghold in which to keep his treasures. Under Philetærus it became the capital of a state, 283 B.C. His successor, Eumenes I., maintained its independence against the Seleucidæ, although the title of king was first assumed by Attalus I., who reigned from 241 to 197 B.C. He intimately allied himself with the Romans against Philip of Macedon, and this alliance subsisted throughout succeeding reigns, in which the kingdom increased in extent and importance, till at last Attalus III., surnamed Philometer, who died in 133 B.C., left it with all his treasures to the Romans, who successfully maintained the right thus acquired, and under whom the city continued to flourish. It was the focus of all the great military and commercial routes of Asia Minor, and Pliny describes it as *longe clarissimum Asiæ Pergamum*. The Attali collected in Pergamus a library only inferior to that of Alexandria. It was also the seat of a famous grammar-school, and it gave its name to parchment (q.v.). Pergamus sank under the Byzantine emperors, but the place still exists under the name *Bergamah*, and is noted for the splendor and magnificence of its ruins, which embrace temples, palaces, aqueducts, gymnasia, amphitheaters, and city walls.

PERGOLESE, GIOVANNI BATTISTA, an eminent musician of the Neapolitan school. Evidence regarding the date and place of his birth is conflicting; probably the correct account is that of the marchese di Villarosa, his latest biographer, who states that he was born at Jesi, near Ancona, on Jan. 3d, 1710. In 1717 he was admitted into the Conservatorio dei Poveri di Gesù Cristo at Naples, where he studied the violin under Domenico di Matteis, and musical composition under Gaetano Greco and Durante. Under the conviction that melody and taste were sacrificed to learning by most of the masters of his time, he abandoned the style of Scarlatti and Greco for that of Vinci and Hasse. His first great work was the oratorio of *San Guglielmo d'Aquitania*, composed in 1731. In that and the following year appeared his operas of *La Serva Padrona; Il Prigionier Superbo;* and *Lo Frate Innamorato;* in 1734, *Adriano in Siria;* in 1735, *Il Flaminio* and *L'Olimpiade*. In 1734 he received the appointment of *maestro di capella* of the church of Loretto. In consequence of delicate health he removed to Pozzuoli, where he composed the cantata of *Orfeo*, and his pathetic *Stabat Mater* He died there of consumption in 1736. Besides the above-mentioned works, Pergolese composed a number of pieces for the church, which were better appreciated during his life-time than his secular compositions, also a violin concerto, and thirty trios for violin, violoncello, and harpsichord. His works are all characterized by sweetness and freedom of style.

PERI (Fairy), according to the mythical lore of the east, a being begotten by fallen spirits, which spends its life in all imaginable delights, is immortal, but is forever excluded from the joys of paradise. It takes an intermediate place between angels and demons, and is either male or female. So far from there being only female peris, as is supposed by some, and these the wives of the devs, the peris live, on the contrary, in constant warfare with these devs. Otherwise, they are of the most innocuous character to mankind, and, exactly as the fairies, with whom our own popular mythology has made us familiar, are, when females, of surpassing beauty. One of the finest compliments to be paid to a Persian lady is to speak of her as perizadeh (born of a peri; Greek, parisatis). They belong to the great family of genii, or gin: a belief in whom is enjoined in the Koran, and for whose conversion, as well as for that of man, Mohammed was sent (cf. Koran, chaps. lv., lxxii., and lxxiv.).

PERIAGUA, a large canoe composed of the trunks of two trees, hollowed and united into one fabric; whereas an ordinary canoe is formed of the body of one tree

only. Periaguas are used in the Pacific, and were formerly employed among the West India islands, whence the frequent allusion to them in *Robinson Crusoe*.

PERIANDER, Tyrant of Corinth, d. B.C. 585; succeeded his father Cypselus about 625. His first measures, on coming to the throne, were to close all the clubs and common tables, and keep the upper classes under espionage. He then raised a fleet and an army, and allied himself with other Greek despots, and with barbarian kings. His last years were unfortunate. His son, Sycophron, was assassinated by the Corcyræans, and Periander killed his wife in a fit of jealousy. His weak-minded son Cypselus was the sole survivor of his dynasty. He is said to have left a didactic poem in 2,000 verses.

PERIANTH (Gr. *peri*, around, *anthos*, a flower), in botany, the floral envelope (see FLOWER) of those plants in which the calyx and corolla are not easily distinguished. The term is convenient, as it can be applied indifferently to the calyx and corolla; thus, when there is either a calyx or corolla existing, but not both, the perianth is said to be *single;* when both are present, *double*. Both are really present in many endogenous plants, to which the use of the term perianth is confined by some botanists; the single floral envelope of exogenous plants being regarded as a calyx, and the corolla supposed to be wanting. The perianth is *regular* in some plants, *irregular* in others. It often displays great beauty, as in tulips, crocuses, lilies, etc.

PERICARDI'TIS, or inflammation of the pericardium (q.v.), is a disease of frequent occurrence; the result of a very large number of post-mortem examinations being to show that about 1 in 23 of all who die at an adult age exhibits traces of recent or old attacks of this disorder.

For reasons which will be obvious when we come to speak of the physical signs of this disease, we shall commence with a notice of the anatomical changes which take place in the inflamed membrane. Very soon after symptoms of pericarditis begin to show themselves there is an abnormal dryness of the serous membrane, which is speedily followed by an increased secretion of fluid. The secreted fluid is sometimes almost entirely fibrinous, in which case it coagulates, and gives rise to adhesions between the heart and the pericardium; or it may consist almost entirely of serum, which remains liquid; or it may be, and it most frequently is, a mixture of the two. When there is a large amount of liquid effusion (as, for instance, a third of a pint or more) which is not re-absorbed, death usually takes place in the course of a few days, in consequence of the interference of the fluid with the heart's actions; but when there is not much liquid effusion, or when the liquid part is absorbed, the pericardium becomes more or less adherent, and apparent recovery usually takes place.

In the cases that prove fatal when fibrinous fluid has been effused, but has not coagulated to such an extent as to cause complete adhesion of the heart to the pericardium, the partially coagulated fibrin (or lymph, as the older authors styled it) is seen to be of a yellowish-white color, and to occur in a rugged, shaggy, or cellular form. Laennec compared the surface on which the lymph is deposited to that which would be produced by suddenly separating two flat pieces of wood between which a thin layer of butter had been compressed. Dr. Watson regards the appearance as more like the rough side of pieces of uncooked tripe than anything else; while others have compared it to lace-work, cut sponge, a honey-comb, a congeries of earth-worms, etc. When the patient dies at a more advanced stage of the disease—viz., soon after the whole of the membrane has become adherent—incipient blood-vessels, in the form of red points and branching lines, are seen, indicating that organization is commencing in the deposit, which, if death had not ensued would have been finally converted into cellular or areolar tissue, and have occasioned the complete obliteration of the pericardial cavity.

The symptoms of pericarditis are pain in the situation of the heart, increased by a full inspiration, by pressure upon or between the ribs in the cardiac region, and especially by pressure upwards against the diaphragm by thrusting the fingers beneath the cartilages of the false ribs; palpitations; a dry cough and hurried respiration; discomfort or pain on lying on the left side; restlessness; great anxiety of countenance; and sometimes delirium. The pulse usually beats from 110 to 120 in a minute, and is sometimes intermittent; and febrile symptoms are always present. These symptoms are seldom collectively present in any individual case, and until the time of Louis the diagnosis of this disease was uncertain and obscure. The physical signs, dependent on the anatomical changes which have been described, are, however, generally so distinct that by their aid the disease can be readily detected. They are three in number. 1. In consequence of irritation propagated to the muscular tissue of the heart at the commencement of the inflammation of its investing membrane, the ventricles contract with increased force, rendering the sounds of the heart louder and its impulse stronger than in health, or than in the more advanced stages of the disease. 2. When much fluid is effused into the pericardium, dullness on percursion is always observable to a greater degree than in health. This sign, which is very characteristic, is seldom perceived till the disease has continued for two or three days. In relation to this increased dullness, we must premise that in the healthy condition of the heart and lungs there is an irregular roundish space with a diameter of somewhat less than 2 in., extending from the sternum (or breast bone) between the level of the fourth and fifth ribs towards the left nipple, in which a portion of the surface of the heart is not overlapped by the lungs, but lies in contact with

the walls of the chest. This space should normally be dull on percussion. In pericarditis the extent of the dullness beyond the normal limit indicates the amount of effusion. In extreme cases the dullness may extend over a space whose diameter is 7 in. or more. Simultaneous with the increased dullness, there is a diminution of the heart's sounds in consequence of the intervening fluid, and the impulse is often scarcely perceptible. 3. The rubbing of the inflamed and roughened surfaces upon each other gives rise to a sound which is commonly called the *friction sound*, but which has received various names. Thus Dr. Watson calls it a *to-and-fro* sound, and observes regarding its variations that, "like all the other morbid sounds heard within the chest, it is capable of much variety in tone and degree Sometimes it very closely resembles the noise made by a saw in cutting through a board; sometimes it is more like that occasioned by the action of a file or of a rasp; but its essential character is that of *alternate rubbing;* it is a *to-and-fro* sound." This sound is heard early in the disease, before the surfaces of the pericardium are separated by the effusion of fluid; and it is due either to the dryness of the membrane, or to its roughness from the deposition of lymph. When the contiguous surfaces are either separated by fluid, or become adherent, the sound disappears; but when it has been lost from the first of these causes, it reappears after the fluid has been so far absorbed as to permit the surfaces again to come in contact. But here, again, its duration is brief, for the surfaces soon become adherent and cease to rub upon each other.

Pericarditis is a disease which occasionally runs a very rapid course, and terminates fatally in forty-eight hours or less. In ordinary cases, however, which terminate in apparent recovery, the disease generally begins to yield in a week or ten days, and excepting that adhesion remains, the cure appears to be complete in three weeks or less. But although these patients *apparently* recover, the pericardial adhesion commonly occasions other structural changes of the heart sooner or later to develop themselves; and in those cases that the physician has the opportunity of subsequently watching, it is observed that fatal disease of the heart, primarily due to the pericarditis, almost always supervenes. In slight cases it is probable that a true cure, without adhesion, may take place.

Pericarditis frequently arises from exposure to cold when the body is warm and perspiring. It is no uncommon result of a contaminated state of the blood, such as occurs in the exanthematous diseases, especially scarlatina, and in Bright's disease of the kidney; but beyond all comparison, it is of most frequent occurrence in association with acute rheumatism (q.v.), of which it forms by far the most dangerous complication.

At the commencement of the disease, blood should be freely taken (if the patient is tolerably robust) from the region of the heart either by cupping or repeated leeching; and at the same time every attempt must be made to get the system under the influence of mercury to the extent of rendering the gums tender and of affecting the breath. Not only should calomel in small doses, and combined with opium with the view of preventing purging, be frequently given, but mercurial ointment should be rubbed into the arm-pits and inner sides of the thighs, and the mouth should be kept slightly sore for some time. After three or four days, if there should be much fluid effusion, a large blister should be applied over the heart; and if the patient is not already under the influence of mercury, the raw surface may be dressed with mercurial ointment. Perfect rest both of body and mind is of essential importance, and all possible causes of excitement should be excluded. The diet should be mild and chiefly farinaceous, and little or no animal food should be allowed till the beginning of convalescence. Cooling drinks are agreeable to the patient, and may be taken freely with advantage throughout the disease.

PERICAR'DIUM, The, is a conical membranous sac, containing the heart and the commencement of the great vessels, to the extent of about two inches from their origin. It is placed with its apex upwards behind the sternum, and to its left side, in the interval between the pleuræ—the serous sacs in which the lungs are inclosed; while its base is attached to the diaphragm. It is a fibro-serous membrane, consisting of an external fibrous and an internal serous layer. The fibrous layer is a strong, dense, fibrous membrane; the serous layer invests the heart, and is then reflected on the inner surface of the fibrous layer. Like all serous membranes, it is a closed sac; its inner surface is smooth and glistening, and secretes a thin fluid which serves to facilitate the natural movements of the heart. It is inflammation of this serous sac which constitutes the disease known as pericarditis.

PERICARP. See Fruit.

PERICLES (Gr. Perikles), the most accomplished statesman of ancient Greece, was b. of distinguished parentage in the early part of the 5th c. B.C. His father was that Xanthippus who won the victory over the Persians at Mycale, 479 B.C., and his mother, Agariste, was the niece of the great Athenian reformer Cleisthenes. Pericles received an elaborate education; but of all his teachers, the one whom he most reverenced, and from whose instructions he derived most benefit, was the philosopher Anaxagoras (q.v.). Pericles was conspicuous all through his career for the singular dignity of his manners, the "Olympian" thunder of his eloquence, his sagacity, probity, and profound Athenian

patriotism. When he entered on public life, Aristides had only recently died, Themistocles was an exile, and Cimon was fighting the battles of his country abroad. Although the family to which he belonged was good, it did not rank among the first in point of either wealth or influence, yet so transcendent were the abilities of Pericles, that he rapidly rose to the highest power in the state as the leader of the dominant democracy. The sincerity of his attachment to the "popular" party has been questioned, but without the shadow of evidence. At any rate, the measures which either personally or through his adherents he brought forward and caused to be passed, were always in favor of extending the privileges of the poorer class of the citizens. Pericles seems to have grasped very clearly, and to have held as firmly, the modern "radical" idea, that as the state is supported by the taxation of the body of the citizens, it must govern with a view to general and not to *caste* interests. In 461 B.C., Pericles, through the agency of his follower, Ephialtes, struck a great blow at the influence of the oligarchy, by causing the decree to be passed which deprived the areopagus of its most important political powers. Shortly after, the democracy obtained another triumph in the ostracism of Cimon. During the next few years the political course pursued by Pericles is not very clearly discernible, but in general his attitude was hostile to the desire for foreign conquest or territorial aggrandizement, so prevalent among his ambitious fellow-citizens. In 454 B.C., or shortly after, he magnanimously proposed the measure (which was carried) for the recall of Cimon, and about the same time commenced negotiations with the other Hellenic states with the view of forming a grand Hellenic confederation, the design of which was to put an end to the mutually destructive wars of kindred peoples —to make of Greece one mighty nation, fit to front the outlying world. The idea was not less sagacious than noble. Had it been accomplished, the semi-barbarous Macedonians would have menaced the civilized Greeks in vain, and even Rome at a later period might perhaps have found the Adriatic, and not the Euphrates, the limits of her empire. But the Spartan aristocrats were utterly incapable of morally appreciating such exalted patriotism, or of understanding the political necessity for it, and by their secret intrigues brought the well-planned scheme to naught. Athens and Sparta were already, and indeed had for some time been, in that mood towards each other which rendered the future Peloponnesian war inevitable. They are always found on opposite sides. When the Spartans, in 448 B.C., restored to the Delphians the guardianship of the temple and treasures of Delphi, of which they had been deprived by the Phocians, the Athenians immediately after marched an army thither, and reinstated the latter. Three years later, an insurrection broke out in the territories tributary to Athens, Megara, Eubœa, etc., and the Spartans again appeared in the field as the allies of the insurgents. The position of Athens was critical. Pericles wisely declined to fight against all his enemies at once. A bribe of ten talents sent the Spartans home, and the insurgents were then rapidly and thoroughly crushed.

Cimon was now dead, and was succeeded in the leadership of the aristocratic party by Thucydides, son of Milesias, who in 444 B.C. made a strong effort to overthrow the supremacy of Pericles by attacking him in the popular assembly for squandering the public money on buildings, and in festivals and amusements. Thucydides made an effective speech; but Pericles immediately rose and offered to execute the buildings at his own expense, if the citizens would allow him to put his own name upon them instead of theirs. The sarcasm was successful, and Pericles was empowered to do as he pleased in the matter. But Pericles did not mean to be simply sarcastic; he wished to point out to the Athenians in a delicate way the spirit and aim of his policy, which was to make Athens, as a city, worthy of being the head and crown of Hellas. His victory in the assembly was followed by the ostracism of Thucydides; and during the rest of his career "there was," says the historian Thucydides, "in name a democracy, but in reality a government in the hands of the first man." The same author, however, informs us that he never did anything unworthy of his high position; that he did not flatter the people, or oppress his adversaries; and that with all his unlimited command of the public purse, he was personally incorruptible. Soon after this the Samian war broke out, in which Pericles acquired high renown as a naval commander. This war originated in a quarrel between tne Milesians and Samians, in which Athens was led to take a part with the former. The Samians, after an obstinate struggle, were beaten, and a peace was concluded in 440 B.C. The position in which Athens then stood towards many of the Greek states was peculiar. Since the time of the Persian invasion she had been the leader of the confederacy formed to resist the attacks of the powerful enemy, and the guardian of the confederate treasury kept in the isle of Delos. Pericles got the treasury removed to Athens, and, commuting the contingents of the allies for money—Athens, of course, herself undertaking to protect the confederacy—enormously increased the contributions to the "patriotic fund." The grand charge against Pericles is, that he applied the money thus obtained to other purposes than those for which it was designed; that, in short, he adorned and enriched Athens with the spoils of the allied states. But the objection is more plausible than solid, for, in point of fact, Athens kept up in admirable discipline a great fleet and a fine army, and Pericles made the Greek name more respected in his time than it had ever been before. It may be that his conduct is open to criticism in some respects, but a broad and just view of the motives which impelled him to act as he did, and a fair consideration of the political exigences of the time will, in

the main, justify his procedure. It is unnecessary to give a detailed account of all that he did to make his native city the most glorious in the ancient world. Greek architecture and sculpture, under his patronage, reached perfection. To Pericles, Athens owed the Parthenon, the Propylæa, the Odeum, and numberless other public and sacred edifices; he also liberally encouraged music and the drama; and, during his rule, industry and commerce were in so flourishing a condition, that prosperity was universal in Attica.

At length in 431 B.C., the long-foreseen and inevitable "Peloponnesian war" broke out between Athens and Sparta. With the circumstances that led to it we have not here to do, but as it terminated most disastrously for Athens, it is but right to say that Pericles is not to blame for the result. Had the policy which he recommended been pursued, one can hardly doubt that Athens, with her immense resources, would have been the victor, and not the vanquished, in the struggle. Pericles himself died in the autumn of 429 B.C., after a lingering sickness. His character has been sufficiently delineated in the outline of his life which we have given. His connection with the brilliant Aspasia (q.v.) is noticed elsewhere.

PERIER, CASIMIR, a celebrated French statesman, was b. at Grenoble, in the department of Isere, France, Oct. 21, 1777. His father had enriched himself by mercantile and industrial pursuits, into which he initiated his two elder sons; but Casimir was still studying at the college of the oratory at Lyon when the revolution broke out. He immediately went to Paris, and there associated himself with his father and elder brother, Antoine-Scipion, in their endeavors to found a banking company. It is sufficient to notice here that the banking company was firmly established, and became the bank of France. Casimir was drafted into the army in 1798, and served in an engineering corps till 1801, when he returned to Paris, and resumed the position of coadjutor to his brother. The house of Perier prospered greatly under the empire; the peace which followed the events of 1815 aided the development of their plans, and gave a wider scope to their enterprises; and the public regarded with special favor men such as these two brothers, who devoted their abilities and fortunes to foster the growth of public, as well as their own, prosperity. In 1817 Perier published three tracts, in which he condemned the financial policy of the ministry. These papers made a lively impression on the public, and led to the return of the author to the chamber of deputies by the electors of Paris. Perier, in his political principles, was essentially a constitutionalist, equally far removed from absolutism on the one hand, and extreme democracy on the other. The elections of 1824, conducted under government influence, resulted in the ousting of the greater portion of the constitutionalists. Perier, however, and a few others of the chiefs of the party retained their seats; but their opposition to the ministerial measures, though constant and unwearying, was quite ineffective; it, however, raised them greatly in public opinion, and secured their re-election, in 1827. In this year Perier had the honor of being elected as representative by both the departments of the Seine and Aube. He defended the loyal and sagacious administration of M. de Martignac, whose representations to the king, Charles X., seemed to have the effect of reconciling the royal party to government in conformity with the charter; but the subsequent rule of the prince de Polignac reduced this hopeful state of affairs to its former critical condition. The revolution (of July, 1830), which Perier, from his experience of that of 1789, had made every endeavor to prevent, now followed, and it only remained for him to render it as bloodless as possible. In this he was successful, through his great influence with the people of Paris. On Aug. 3 he was elected president of the chamber of deputies, but resigned this office on the 11th of the same month to become a member of the ministry. When Laffitte became president of the council (Nov. 2), Perier, fearing that the tendencies of the ministry were too revolutionary, resigned office, and resumed the presidency of the chamber of deputies. On Mar. 13, 1831, he succeeded Laffitte as minister, and gave his whole attention to the repression of revolution, the maintenance of order at home and of peace abroad, originating the political system known as the *justemilieu* (q.v.). His foreign policy was very successful; he greatly contributed to the maintenance of Belgian independence, the suppression of the Miguelite insurrection in Portugal, the counterbalancing of Austrian influence in Italy, and, in general, to the spread and progress of constitutional liberty both at home and abroad; but the rapid growth of extreme liberalism in France, partly owing to previous encouragement unwittingly afforded by himself, was a source of great annoyance to him. On the outbreak of cholera in Paris, Mar., 1832, Perier made the most extraordinary exertions for the enforcement of the necessary sanatory measures; but he was attacked by the disease, and his system being already exhausted by over-exertion, he died May 16, 1832. No public man in France was ever so generally and sincerely lamented, and a monument to his memory was erected by public subscription in the cemetery of Père-la-Chaise.

PERIGEE (Gr. *peri*, near; *gē*, earth), that point in the moon's orbit which is nearest to the earth. The opposite point is the Apogee (q.v.). See MOON.

PÉRIGORD, an old division of S.W. France in Guienne, and now forming part of Dordogne and Gironde. During the reign of Henry IV., in the 8th c., it became a county, and was added to the crown; and at one time was divided into upper and lower Perigord. Perigueux and Sarlat were the capitals.

PÉRIGUEUX, a t. of France, capital of the department of Dordogne, and situated on the right bank of the Isle, 42 m. s.e. of Angoulême. It consists of the ancient city of Perigueux proper—which is gloomy in aspect, and has narrow streets, but large and solidly-built houses—and the *Puy St. Front,* which, until the year 1240, was a separate and a rival town. In the old town there are many curious remains of Gothic architecture. The old ramparts have been demolished, and replaced by beautiful and spacious boulevards. The cathedral of St. Front is a majestic edifice, restored at the end of the 15th century. Quarries of building-stone are worked in the vicinity, and many hands are employed in cutting and polishing marble. Paper, woolen cloths, cutlery, and hosiery are manufactured. The celebrated *Pâtés de Périgueux,* made of partridges and truffles, are largely made and exported. Pop. '91, 30,725.

Perigueux, a town of the highest antiquity, is the *Vesunna* mentioned by Cæsar. In ancient times it was a city of much importance. It stood at the junction of five Roman roads, and contained a number of splendid edifices. Close to the modern town are still to be seen the remains of a vast amphitheater, oval in form, and larger in its dimensions than the ancient amphitheater of Nîmes. There are also remains of ancient aqueducts, baths, and temples. The *Tour de Vésonne* is the most remarkable fragment of Roman architecture. It is still 67 ft. high, and appears to have been much higher; is 200 ft. in circumference, and has walls 6 ft. thick. It has neither doors nor windows. Its purpose is not known.

PERIHE'LION (Gr. *peri,* and *hēlios,* the sun), that point in its orbit at which a planet is nearest the sun. The point of the orbit opposite to it is called the Aphelion (q.v.). The position of the perihelion, i.e., its longitude e. or w. of the equinox, is one of the seven elements of a planet's orbit.

PERIM', a small island belonging to Great Britain, situated in the strait of Bab-el-Mandeb, at the entrance to the Red sea; lat. 12° 40′ 30″ n., long. 43° 23′ east. Perim is level, and is slightly elevated above the sea, and is 3½ m. long; is 1½ m. from the Arabian, and 10 m. from the African coast. Pop. '91, 151. On both sides of this island the navigation is easy; the little strait, between the island and Arabia, is the passage most generally taken by vessels. The island is bare, destitute of fresh water, and ill-furnished with provisions, which are brought for the most part from Aden. Perim owes its importance wholly to its commanding position at the entrance of the Red sea. On its s.w. side is an excellent harbor, capable of accommodating 40 men-of-war, within 100 yards from the shore. There is a walled lighthouse on the island. Fortifications were erected on the island in 1857, but, with the temporary arsenal, etc., were subsequently removed again. It was captured by sir David Baird, and then occupied by the English in 1799, and held by them as a check upon the designs of the French, who were then in Egypt. It was abandoned in 1801, but was re-occupied by Great Britain in 1857, with a view to the protection of her Indian possessions, which were thought to be exposed to some chance of danger from the opening of the Suez canal (q.v.).

PERIMETER (Gr. *peri,* around, *metron,* a measure) and PERIPHERY (Gr. *phero,* I carry) are terms denoting the boundary, or the length of the boundary, of any closed plane figure; though the term "perimeter" is generally confined to those figures which are bounded by straight lines.

PERINÆUM. The part of the human body which forms the floor of the true pelvis is by anatomists divided into two portions. Of these, the anterior one, situated in front of the anus, is called the *true perinæum,* or urethral portion of the perinæum; the posterior portion, which contains the anus or termination of the rectum, is called the ischio-rectal region, or anal portion of the perinæum. The anterior portion, or true perinæum, is triangular in form, the apex being in front; the sides, about 3 in. in length, are formed by the rami of the pubes and ischium; and the base by an imaginary line joining the tuberosities of the ischium, and passing about half an inch in front of the anus. Through this space the uretha passes through a layer of strong fascia—the deep perinæal fascia—to communicate with the bladder, and in this space the opening is made in the operation of lithotomy.

PE'RIOD, a term used in chronology in the same sense as cycle (q.v.), to denote an interval of time after which the astronomical phenomena to which it refers recur in the same order. It is also employed to signify a cycle of cycles. Various periods have been invented by astronomers, but we can only notice a few of the most important.

The Chaldeans invented the *Chaldaic Period,* or *Period of Eclipses,* from observing that, after a certain number of revolutions of the moon round the earth, her eclipses recurred in the same order and of the same magnitude. This period consists of 223 lunations, or 6,798.28 days, and corresponds almost exactly to a complete revolution of the moon's node. The Egyptians made use of the *Dog-star, Siriacal,* or *Sothric Period,* as it is variously called, to compare their civil year of 365 days with the true or Julian year of 365¼ days. The period consequently consisted of 1460 Julian years, corresponding to 1461 Egyptian years, after the lapse of which the dates in both reckonings coincided. By comparing the solar and lunar years, Meton, an Athenian, invented (432 B.C.) a lunar period of 6,940 days, called from him the *Metonic Cycle* (q.v.), also the *Lunar Cycle.* About a century afterwards, the cycle of Meton was discovered to be an insuffi-

cient approximation to the truth, and as he had made the solar year too long by about $\frac{1}{76}$th of a day, at the end of 4 Metonic cycles the solar reckoning was in advance of the lunar by about 1 day 6 hours. To remedy this, a new period, called the *Calippic Period*, was invented by Calippus, and consisted of 4 Metonic cycles less by 1 day, or 27,759 days. But as this period still gave a difference of 6 hours between the solar and lunar reckonings, it was improved by Hipparchus, who invented the *Hipparchic Period* of 4 Calippic periods less by 1 day, or 111,035 days, or about 304 Julian years, which is an exceedingly close approximation, being only $6\frac{1}{2}$ minutes too long, when measured by the tropical year; and too short but by an almost inappreciable quantity, when measured by the *Synodic Month* (see MONTH). The *period of the Heliacal* or *Solar Cycle*, after which the same day of the month falls upon the same day of the week, consists of 28 Julian years. If the year had regularly consisted of 365 days, that is, one day more than an exact number of weeks, it is evident that, at the end of seven years, the days of the month and week would again correspond; but the introduction of an intercalary day into every fourth year causes this coincidence to recur at irregular periods of 6, 11, 6, and 5 years successively. However, by chosing a period such as will preserve the leap-years in the same relative position to the other years, and at the same time consist of an exact number of weeks (both of which objects are effected by using the number 28, which is the least common multiple of 4 and 7), we insure the *regular* recurrence of the coincidence between the days of the week and of the month. The solar cycle is supposed to have been invented about the time of the council of Nice (325 A.D.), but it is arranged so that the first year of the first cycle corresponds to 9 B.C. In calculating the position of any year in the solar cycle, care must be taken to allow for the omission of the intercalary day at the beginning of each century, and its insertion in the first year of every fourth century. See LEAP-YEAR. The year 1880 is the 13th of the solar cycle. The *Julian Period* is a cycle of cycles, and consists of 7,980 (=28×19×15) years, after the lapse of which the solar cycle, lunar cycle, and the indiction (q.v.) commence together. The period of its commencement has been arranged so that it will expire at the same time as the other three periods from which it has been derived. The year 4713 B.C. is taken as the first year of the first period, consequently, 1 A.D. was the 4714th of it, and the year 1885 was the 6598th. See CHRONOLOGY.

PERIODICAL, a publication which appears continuously at regular intervals, and whose contents may be devoted to criticism, politics, religion, literature, science, arts, amusement, or general and miscellaneous subjects. Those periodicals which consist of a collection of critical essays are called reviews.

The earliest periodical in Great Britain seems to have been the *Philosophical Transactions of the Royal Society*, which first appeared in 1665, and contained notices of books as well as original papers. Periodicals professing to notice the books that were being published appeared soon after from time to time under the name of *All the Works of the Learned;* and in 1692 appeared the *Gentlemen's Journal, or Monthly Miscellany*, properly speaking, the first English magazine. The *Gentleman's Magazine* was founded in 1731 by Cave the printer, a periodical which secured a fortune for its proprietor, and, after surviving all its competitors, still exists, though lately somewhat assimilated in form to the new class of magazines. The periodical literature of Scotland was long represented by the *Scots Magazine*, founded in 1739. The first English periodical that attempted anything like criticism was the *Monthly Review*, begun in 1749. It was followed in 1756 by the *Critical Review*, founded by Smollett; and these two were long the leading periodicals of their class, though their criticism was but meager and unsatisfactory, according to our present notions. Another critical journal, called the *Anti-Jacobin*, was established in 1798. In 1802 a new era in criticism was inaugurated by the establishment in Scotland of the *Edinburgh Review* (q.v.); which was followed in London by the *Quarterly Review*, of about equal merit and opposite politics, supported by sir Walter Scott, Southey, S. T. Coleridge, Heber, and at a later period by Hartley Coleridge, lord Mahon, and Gladstone. Another very important periodical, *Blackwood's Magazine*, sprung up in Edinburgh in 1817, under the auspices of John Wilson and Lockhart, as much above the literary mark of former magazines, as the *Edinburgh* and *Quarterly* were above the mark of preceding reviews, strongly devoted to the interests of conservatism, and, in its early years, somewhat violent in its politics. The review, in the course of time, became the favorite medium for all parties to disseminate their views on political, literary, or theological subjects. Of various reviews after the model of the *Edinburgh* and *Quarterly*, and published, like them, four times in the year, some, as the *North British Review* and *National Review*, after having had a flourishing existence for some time, succumbed to the demand for cheaper periodicals, appearing at more frequent intervals. Among existing reviews appearing quarterly may be mentioned the *Edinburgh* and *Quarterly*, which are still among our foremost periodicals; the *Westminster Review*, established 1824, characterized by freedom in handling philosophical and theological topics, and containing essays by J. S. Mill, Carlyle, Grote, John Sterling, and lord Houghton; and the *Dublin Review*, Roman Catholic, founded in 1836. Many of the newer reviews appear monthly. Of these, the *Contemporary Review* and the *Nineteenth Century* are both very ably conducted; so is also the *Fortnightly Review* (at first published twice a month), considered the organ

of the very advanced liberal party. There are also weekly reviews, which unite with the review more or less of the character of a newspaper: of these, the most widely circulated and influential are the *Athenæum*, established in 1828, the *Saturday Review*, in 1856; and the *Academy*, in 1869, at first published monthly. Other more or less recently established reviews are *Nature* (1869), a weekly (illustrated) journal devoted to the interests of natural science; the *Popular Science Review* (quarterly); and *Mind* (quarterly), established in 1876, and devoted to mental science. The articles in the older reviews are generally anonymous; in the newer, it has become to a large extent the practice for the authors to adhibit their names.

The greater part of magazines or periodicals of a more miscellaneous character appear monthly, and their system of management is somewhat similar to that of reviews; but the articles are generally shorter, the subjects more varied, consisting often of tales and novels, which appear there as serials, continued from number to number. Some of the most popular novels of the present day have first been published in magazines. *Blackwood* was the precursor of various monthly magazines of repute, the most important being *Fraser's Magazine*, published 1830–82, which maintained a high literary character. The usual price of these periodicals is 2s. 6d.; but in 1859–60, several new magazines, *Macmillan's Magazine*, the *Cornhill*, *Temple Bar*, *London Society*, and the *St. James's Magazine*, were started at the cheaper price of a shilling, under favorable auspices, and the number of these shilling magazines is increasing. In Great Britain, there are now many weekly periodicals, chiefly of an instructive and amusing kind, price from a penny to threepence each. This class of publications received an impetus and proper direction by the issue of *Chambers's Journal* and the *Penny Magazine* of the "Society for the Diffusion of Useful Knowledge" in 1832. It is customary for the publishers of these weekly sheets to issue them accumulatively in parts monthly under a cover, wherefore they largely answer the purpose of monthly magazines. The rate of payment for writing in the higher class reviews is usually £10, 10s. per sheet of 16 demy 8vo pages; in the weekly periodicals, half a guinea to a guinea per column is ordinarily paid, but in some instances the price paid is very much greater; such particularly is the case as regards novels.

The quarterly reviews, and the magazines in course of weekly or monthly publication, number about 1,100, and of these above 300 are denominational or religious. Of this number only about 12 are, strictly speaking, reviews.

France possessed as far back as 1665 a critical review called the *Journal des Savants*, which, after a lengthened interruption, began again in 1816, and holds a respectable position as a scientific journal. A number of literary and scientific journals sprung up in last century, as the *Nouveau Journal des Savants*, *Journal Littéraire*, *Journal Encyclopédique*, etc. Among the best was the *Magazin Encyclopédique*, begun in 1795, and from 1819 to 1835, combined with the *Revue Encyclopédique*. One of the most noted critical journals in Europe is published in Paris, the *Revue des Deux Mondes*, which began in 1829, and has, since 1831, appeared fortnightly. In it and the other French periodicals of the same kind, the review form is not so completely preserved as with us: a proportion of tales, poetry, etc., is admitted, and the names of the contributors are required to be attached to their articles. The *Revue des Deux Mondes* has had many shortlived imitators, more or less identified with different political parties. The principal French reviews of more recent date are the *Revue Contemporaine*, *Athenæum Française*, *Revue d'Europe*.

In Germany, reviews have taken even a deeper root than in England. The *Göttinger Gelehrte Anzeigen*, which is the oldest publication of the kind, still preserves a high character. German criticism can, however, hardly be said to have begun before the time of Lessing, who, in conjunction with Nicolai of Berlin, established in 1757, the *Bibliothek der schönen Wissenschaften*, and afterwards various other journals, characterized by an independence of thought unknown before. The *Allgemeine Literaturzeitung*, founded at Jena in 1785, was a periodical of a still higher character, having for contributors the most eminent literary men of the period. When transferred from Jena to Halle, another journal, called the *Jenaische Allgemeine Literaturzeitung*, sprung up at the former place, under the auspices of the celebrated literary circle at Weimar, of whom Goethe was the center. These two periodicals existed till 1848. Of modern German reviews, the *Deutsche Rundschau* and the *Literarisches Centralblatt* are specimens of two different types, The *Deutsches Museum*, the *Gartenlaube* (the most widely read of German periodicals, with a circulation of nearly 400,000), and *Im Neuen Reich*, are rather magazines than reviews.

Italy possessed a critical journal, *Giornale dei Litterati*, as far back as 1710, conducted by Apostolo Zeno, which continued for 23 years. A new journal of the same name, founded at Pisa in 1771, attained considerable repute. From 1826 to 1830, the *Biblioteca Italiana* and *Antologia di Firenze*, were reviews of considerable ability. The scientific periodicals of Italy are generally creditable. More than 30 periodicals are now published in Rome alone, the number having rapidly increased since the events of 1870.

As is well known, the first attempt to establish a periodical in the United States was made in 1741, when Franklin issued his *General Magazine and Historical Chronicle* at Philadelphia. This periodical lasted but half a year, and the *American Magazine*, which was started soon afterward, suspended after the second number. Other periodicals published before the revolution were: the *American Magazine and Historical Chronicle*

(1743–46); the *Boston Weekly Museum* (1743, 4 numbers); the *Independent Reflector* (1752–54); the *New England Magazine* (1758); the *American Magazine* (1757–58); the *North American Magazine* (1758–66); the *American Magazine* (1769); the *Royal American Magazine* (1774–75); and the *Pennsylvania Magazine* (1775); the *Knickerbocker*, founded by C. F. Hoffman at New York in 1832, and continued till 1862, and *Putnam's Monthly*, issued in the same city from 1853 to 1857 and from 1867 to 1869, were popular American magazines. The best known magazines published in the United States at the present time are the *Atlantic Monthly*, founded in Boston in 1857, and edited successively by J. R. Lowell, J. T. Fields, W. D. Howells, and T. B. Aldrich; *Harper's New Monthly Magazine*, founded in New York in 1850, edited by Henry M. Alden; *Century* (monthly), founded in New York in 1870 (long edited as *Scribner's Monthly*), by Dr. J. G. Holland, now by R. W. Gilder; and *Lippincott's Magazine*, Philadelphia. The *Eclectic Magazine*, *Littell's Living Age*, and the *Library Magazine*, are principally devoted to reprints from foreign periodicals. The *North American Review*, founded in Boston in 1815, and the *International Review*, begun at New York in 1874, are of a graver character. *St. Nicholas* and *Wide Awake* are popular magazines for children. W. F. Poole publishes from time to time new editions of his *Index to Periodical Literature*, giving full lists of the titles of articles that have appeared in English and American periodicals to the present time.

Perhaps the most remarkable development in the periodical literature of America during the last decade has been in illustrations. *Harper's Monthly* and *The Century* (the name assumed by *Scribner's Magazine* in 1881, Nov.) have vied with each other in bringing the art of wood-engraving to a technical perfection never reached before. While this has largely increased the cost of publication, it has also swelled their subscription lists to unprecedented dimensions. Both magazines have a large circulation in Great Britain as well as in the U. S., the Harpers publishing an edition there which is expressly prepared for the market by an English editor. The only British periodical approaching in circulation these American monthlies is Macmillan's *English Illustrated Magazine*, founded in 1884, Feb.; but its subscription price is less than half that of its rivals, and consequently neither in the quantity nor in the quality of its illustrations does it attempt to compete with them. Two short-lived American periodicals, which started with great expectations, that were apparently warranted by their intrinsic merits, were *The Continent* and *The Manhattan*. The latter was founded in New York, 1883, Jan., and expired in less than two years. The former made a far harder struggle for existence. It was started at Philadelphia, in 1879, by the Continent Publishing Co., with Albion W. Tourgée as its editor; was then transferred to New York, and came to a sudden close, 1884. In 1887 the firm of Charles Scribner's Sons began the publication of *Scribner's Magazine*, a new enterprise. See MAGAZINES.

PERIODICITY (in physiology and pathology). The tendency manifested by various phenomena occurring in living animals to recur, after equal, or nearly equal intervals of time, is so marked, that Bichat, the great French anatomist and physiologist, described it under the title of the *Loi d'Intermittence*. The alternation of sleep and waking, the phenomena of menstruation, and the punctual return of hunger, are some of the most obvious instances of periodicity that can be suggested as occurring in the healthy subject; while less obvious examples are afforded by the apparently regular variations that have been observed in the excretion of carbonic acid from the lungs, and in the number of the pulsations of the heart at different periods of the 24 hours. As is well known by experience, periodicity may be usefully cultivated and fixed in daily habits. This is well exemplified in the case of sleep, but in a more special degree by the daily relieving of the bowels at a particular hour, a habit in which it is important that all young persons should be carefully instructed with a view to health and convenience.

In certain forms of disease, the law of periodicity or intermission is very distinctly seen. The regular periodic recurrence of the paroxysms of intermittent fever (or ague), is universally known, although the cause of the periodicity has hitherto baffled all inquiry.

Ague often gives rise to periodic diseases which present no close analogy to that disease. Thus it—or, at all events, malaria—is a frequent cause of tic douloureux, recurring at regular intervals; cases are recorded in which periodical vomiting, occurring weekly, or, in one case, at an interval of ten days, seemed to be due to it; and Mr. Moore, surgeon to the Middlesex hospital, not long ago published the case of a woman who experienced a periodical inflammatory swelling of the right knee, as a sequence of that disorder. Epilepsy is a disease in which the intervals (especially in women) tend to a regular period. Sir Henry Holland (*Medical Notes and Reflections*, 2d ed., page 341) records a case in which "six attacks occurred, with intervals of 16 or 18 minutes between; so exactly recurring, as noted by the watch, that it was impossible to suppose it a mere casuality;" and another, "where a spasmodic seizure, more of tetanic than epileptic character, occurred twice a day for many weeks successively, and almost exactly at the same hours each day." For many other examples of periodic or intermittent morbid action, the reader is referred to a memoir by Henle, "On the Course and Periodicity of Disease," in his *Pathologische Untersuchungen;* and to sir Henry Holland's essay (to which we have already referred) in his *Medical Notes and Reflections*. The most important practical fact in relation to this class of diseases is, that they almost invariably yield to the action of certain medicines, especially bark and arsenic.

Exercising a beneficial or mischievous influence, as the case may be, the habit of periodicity is to be seduously shunned in every instance likely to prove morally or physically prejudicial. No more marked example of the injudicious cultivation of periodicity could be given than in the evil practice of periodical blood-letting, which once prevailed all over Europe, and was only abandoned in recent times as not only useless, but in all respects injurious.

PERIŒ'CI (Gr. *Perioikoi*, literally, "dwellers round about," i.e., round about some particular locality or city) was the name given, in ancient Greece, to the original Achaian inhabitants of Laconia by their Dorian conquerors. The Periœci were not slaves, like the Helots (q.v.); they were merely a vassal population, personally free, cultivating their own ground, and carrying on most of the home and foreign trade of Laconia, but possessing no political rights, incapable of intermarrying with the Dorians of Sparta, or of holding important state-offices, and subjected to a land-tax in token of their dependent condition. They have been—as regards their political position—compared to the Saxons of England after the Norman conquest, and seldom has a historical parallel been so sound. The Periœci must have been very numerous, for they occupied at one time upwards of 100 cities, several of which were on the coast, whence the whole seaboard of Laconia bore the name of the *Perioikois*, and they produced capital sailors, which doubtless accounts for the anomalous fact of Periœci being occasionally invested with the command of the Spartan fleet. They also formed a part of the Spartan army. At the battle of Platæa (479 B.C.), there were 10,000 Periœci present. These dependent Achaians were not, however, all on a dead level of vassalage; they lived in regularly organized communities, where the social distinctions of rank, refinement, and wealth, were as marked as elsewhere. Xenophon speaks of "accomplished and well-born gentlemen" (*kaloi k'agathoi*) among the Periœci serving as volunteers in the Spartan army; and such artists and men of culture as Lacedæmon produced in all probability belonged to this class. Periœci also existed in the other Dorian communities of the Peloponnesus.

PERIOS'TEUM (Gr. *peri*, around, and *osteon*, bone), a tough fibrous membrane which surrounds the various bones. It is highly vascular, and is the means by which the outer layers of the shafts and the greater part of the spongy portions of the bones are supplied with blood. "From the internal surface of the periosteum also is produced a layer of soft blastema (or plastic fluid in which cells are developed), by means of which additions are made to the exterior of the growing bones. The process of ossification going on in the inner part of this blastema contributes to the thickness of the bone, while a fresh supply is continually being added to the exterior of the blastema, through the medium of the vessels of the periosteum."—Humphry, *On the Human Skeleton*, page 19. In young bones this membrane is thick, and in consequence of the intervening blastema is very easily detached from the bone; but in the bones of the adult it is less thick and vascular, while its connection with the bone becomes closer, in consequence of the blastema being less; while in aged persons it is very thin, its vessels are scanty, and there is no blastema. Numerous experiments show that the formation of bone is essentially due to the action of this membrane; and that, by transplanting detached portions of periosteum into muscular or other tissues, bony tissue is generated in those parts. In most cases in which this membrane has become detached in consequence of a wound or of disease, the exposed bone (except in the instance of the skull, which derives most of its nutrient matter from the dura mater) perishes; but this is not invariably the case. Amongst its other offices, it serves, by isolating the bone from the surrounding tissues, to prevent the spread of disease from them to it. The shin-bone, or tibia, is thus indebted to the periosteum for its ordinary immunity, in cases of ulcer in that region.

PERIOSTI'TIS, or INFLAMMATION OF THE PERIOSTEUM, generally occurs on the surface of thinly-covered bones, such as the tibia, clavicles, and cranial bones. Its chief causes are (1) a *syphilitic taint*, in which oval swellings, called *nodes* (q.v.), are produced; (2) *rheumatism*; and (3) *scrofula*. In the two latter cases there is a periosteal swelling around the whole circumference or surface of the bone. The affection, especially when due to the first or second of the above causes, is usually accompanied with considerable nocturnal pain. If the disease occurs in an acute form, it must be treated with leeches, fomentations, and the other ordinary antiphlogistic (or lowering) remedies. When it becomes chronic, the treatment must be mainly directed to the cause which has originated it. In almost all cases, the nocturnal pains are best relieved by somewhat large doses (five to ten grains) of iodide of potassium, taken three times a day on an empty stomach.

PERIPATET'IC PHILOSOPHY, a designation of the philosophy of Aristotle (q.v.) and of his followers. It is of doubtful origin, being supposed to have been derived either from his custom of occasionally walking about (*peripatein*) during the delivery of his lectures, or from the place in which they were delivered having been a shaded walk of the lyceum.

PERIPNEUMO'NIA, an inflammation of the membrane which invests the lungs, accompanied with general disturbance of the whole system; remarkably prevalent among horses in south Africa, in a zone from 20° to 27° s. lat. It is very fatal; and to its prevalence and virulence Dr. Livingstone is disposed to ascribe the fact that horses, although so

abundant in the more northern parts of Africa, were unknown in the south till introduced by Europeans; this invisible barrier being more insurmountable than mountain ranges, deserts, or rivers. The season during which peripneumonia prevails is from December to April. Zebras, antelopes, and oxen are liable to its attacks, but no kind of quadruped suffers so much from it as the horse. The flesh of animals which die of peripneumonia is unwholesome, and produces a malignant carbuncle in persons who eat it.

PERIP'TERAL (Gr. *peri;* and *pteron*, a wing), a term applied to temples or like buildings having columns all round the cella.

PERISSODAC'TYLA, a section of the order *ungulata* (q.v.), including the horse (q.v.), rhinoceros (q.v.), and the tapir (q.v.).

PERISTAL'TIC MOTION. The terms *peristaltic* (Gr. *clasping and compressing*) and *vermicular* (or worm-like) are applied to the peculiar motion or action of the muscular coat of the intestines, by which the substances contained within it are regularly moved onward.

This action of the intestines is readily seen on opening an animal (a dog, cat, or rabbit, for example) immediately after it has been killed; and in these circumstances it is perhaps exaggerated, from the stimulating action of the cold air; and it may be shown in an abnormally active state, although not altered in character, by subjecting the exposed intestines to the influence of the electro-magnetic machine.

It appears, from the observations made by Brinton, Todd, and Bowman, and others, on recently killed animals, that the peristaltic motion commences at the pyloric third of the stomach (see DIGESTION, ORGANS OF,), whence successive waves of contraction and relaxation are propagated downwards throughout the whole length of the intestinal canal. "In examining a portion of intestine at the moment of its contraction, we perceive a dilatation above it as well as below it; the latter being produced by the protrusion into it of the contents of the now contracted portion of intestine; the former by the relaxation of a previously contracted portion. The rapid succession of these contractions and relaxations gives to the movements of the intestines the appearance of the writhings of a worm, whence they are distinguished by the appellation *vermicular*."—Todd and Bowman's *Physical Anatomy of Man*, vol. ii. p. 236. These movements can occasionally be observed during life in the human subject, indirectly, in cases of extreme attenuation of the abdominal walls, and directly in wounds of the abdomen, and during certain surgical operations. There are differences of opinion as to the cause of the peristaltic action; thus Todd and Bowman assert that "the intestinal movements are partly due to the influence of the stimulus of distention upon the muscular tissue, and partly to the reflex action of the ganglia of the intestinal portion of the sympathetic, stimulated by the contact of the intestinal contents with the mucous membrane;" while Carpenter maintains that "the intestinal tube from the stomach to the rectum is not dependent upon the nervous centers either for its contractility or for its power of exercising it, but is enabled to propel its contents by its own inherent powers."

Numerous observations tend to show that this motion has a nearly definite velocity in each individual. Most commonly the act of defecation takes place with perfect regularity every 24 or (more rarely) every 12 hours, the quantity discharged being almost constant if the mode of living does not vary. Heberden (*Commentarii*, p 14) mentions a person who regularly had a motion once a month, and (by way of contrast) another who had twelve motions every day during thirty years, and then seven every day for seven years, and rather grew fat than otherwise. Ponteau (*Œuvres Posthumes*, tome i. p. 27) records the case of a young lady who had no stool for upwards of eight years, although during the last year she ate abundantly of fruit, and drank coffee, milk, and tea, and broth with yelk of eggs; but she had copious greasy sweats. Such a case as this is possible, but far from probable.

That the influence of *expectant attention* on the muscular movements of the intestine (and especially of its lower portion) is very great is shown in various ways. It is, for the most part, thus that *habit* operates in producing a readiness for defecation at one special hour in the day, and that bread-pills and other equally inert substances act on the bowels, if the patient believes them to be purgatives. Dr. Carpenter, in his remarks on "the influence of expectant attention on muscular movements," in the chapter of his *Human Physiology* treating "of muscular movements," mentions two very striking cases of the kind which have fallen within his own knowledge.

PERISTE'RIA. See HOLY SPIRIT PLANT.

PERISTYLE, a colonnade around the interior of a court-yard or other building.

PERITONE'UM (Gr. *periteinein*, to extend around), a serous membrane, and, like all membranes of this class, a shut sac, which, however, in the female, is not completely closed, as the Fallopian tubes communicate with it by their free extremities. The peritoneum more or less completely invests all the viscera lying in the abdominal and pelvic cavities, and is then reflected upon the walls of the abdomen, so that there is a visceral and a parietal layer. Numerous folds are formed by the visceral layer as it passes from one organ to another. They serve to hold the parts in position, and at the same time enclose vessels and nerves. Some of these folds are termed *ligaments*, from their serving

to support the organs. Thus we have ligaments of the liver, spleen, bladder, and uterus formed by peritoneal folds. Others are termed *mesenteries* (from the Gr. *meson*, the middle, and *enteron*, the intestine), and connect the intestines with the vertebral column. They are the mesentery proper (q.v.), which has been already described, the ascending transverse, and descending meso-colon, and the meso-rectum. Lastly, there are folds called *omenta*, which proceed from one viscus to another. They are three in number—viz., the *lesser* or *gastro-hepatic omentum*, which extends from the under-surface of the liver to the lesser curvature of the stomach; the *gastro-splenic omentum;* and the *great* (or *gastro-colic*) *omentum*, which consists of four layers of peritoneum, the two which descend from the stomach, and the same two returning upon themselves, and ascending as high as the transverse colon, where they separate, and inclose that organ. These separate layers may be easily seen in the young subject, but in the adult they are more or less blended. The great omentum always contains some adipose tissue, which, in persons inclined to corpulency, often accumulates to an enormous extent. Its use appears to be (1) to protect the intestines from cold by covering them anteriorly as with an apron, and (2) to facilitate their movement upon each other during their vermicular action.

Like all the serous membranes, the peritoneum readily takes on inflammation from various exciting causes. This inflammation is termed peritonitis (q.v.).

PERITONI'TIS, or Inflammation of the Peritoneum, may be either an acute or a chronic disease.

Acute peritonitis generally presents well-marked symptoms. It sometimes commences with a chill, but severe pain in the abdomen is usually the first symptom. The pain is at first sometimes confined to particular spots (usually in the lower part of the abdomen), but it soon extends over the whole abdominal region. It is increased, on pressure, to such an extent that the patient cannot even bear the weight of the bedclothes; and to avoid, as far as possible, internal pressure upon the peritoneum, he lies perfectly still, on his back, with the legs drawn up, and breathes by means of the ribs, in consequence of the pain occasioned by the descent of the diaphragm in inspiration. The breathing is naturally shallow in these cases, and, less air being admitted at each movement of respiration, the number of those movements is increased. There are perhaps 40 or even 60 respirations executed in a minute, instead of 18 or 20. The pulse is usually very frequent, often 120 or more in the minute, and small and tense, though occasionally strong and full at the commencement of the attack. After the disease has continued for a certain time, the belly becomes tense and swollen, the enlargement being caused at first by flatus, and afterward also by the effusion of fluid, as may be ascertained by percussion and auscultation.

The progress of the disease is in general rapid. In fatal cases, death usually takes place within a week, and often sooner. The symptoms indicating that the disease is advancing towards a fatal termination are great distention of the abdomen, a very frequent and feeble pulse, a pinched and extremely anxious appearance of the face, and cold sweats.

Peritonitis may arise from any of the ordinary causes of inflammation, such as sudden change of temperature (especially the combined effects of cold and wet on the surface of the body), excessive use of stimulating fluids, the suppression of long-standing discharges, translation of gout and rheumatism, etc. It is frequently the result of local violence, and of wounds penetrating the peritoneal sac, including various surgical operations. Besides the above causes, there are two which give rise to special varieties of peritonitis, viz., contagion or infection, which often prevails epidemically, and produces great mortality amongst women after childbirth, giving rise to puerperal peritonitis, one of the most perilous accompaniments of the awful disorder known as puerperal fever (q.v.); and perforation of the stomach, bowels, gall bladder, urinary bladder, etc., by which their contents are allowed to escape into the peritoneal cavity, where they excite the most violent inflammation. *Peritonitis* from *perforation* is characterized by the suddenness of the attack, intense pain, incapable of mitigation by medicine, all at once arising in some part of the abdomen, the whole of which soon becomes tender in every part. This form of the disease is generally fatal, death usually ensuing within two days, and sometimes within a few hours. Perforation of the small intestine, in consequence of ulceration of the glands, is of not uncommon occurrence in continued (typhoid) fever, and sometimes occurs in phthisis. That apparently useless structure, the vermiform appendage of the cæcum, is a comparatively frequent seat of perforation. Sometimes it is the stomach which is perforated, and in these cases the patients are usually unmarried women (especially domestic servants), who had previously appeared in good health, or at most had complained of slight dyspepsia.

The only disease with which peritonitis is likely to be confounded by the well-educated practitioner is a peculiar form of hysteria; but the age and sex of the patient, the presence of hysteria in other forms, and the general history of the patient and of her symptoms, will almost always lead to a correct diagnosis of the disease.

The treatment, in an ordinary case of peritonitis (not arising from mechanical injury, or perforation from disease; or occurring in connection with puerperal fever), consists, if the patient is moderately robust, in bleeding from the arm, till a decided impression

has been made on the circulation; after which the abdomen should be covered with 20 or 30 leeches, and the bleeding from their bites should be encouraged by fomenting the belly with flannels wrung out of hot water, or, if the patient can bear its weight, by the application of a light poultice. The system must, at the same time, be got as speedily as possible under the influence of mercury, by the means described in the treatment of pericarditis (q.v.). Opium may be given freely, not merely to guard against the purgative action of the calomel, but with the view of securing sleep to the patient, and quiet to the inflamed membrane. The patient must be kept on low diet, unless indications of sinking appear. In peritonitis from perforation the only remedy is opium, which must be given in large and repeated doses, so as to keep the bowels perfectly at rest, in order to promote the formation of adhesion, by which alone the patient can be possibly saved. For the same reason, perfect rest must also be insisted on, and even drinks forbidden, thirst being allayed by the application of ice to the tongue.

Chronic peritonitis occurs in two forms, which differ in their origin and degree of fatality, but are very similar in their symptoms. In the first the inflammation is of the ordinary character, and, although the disease sometimes originates spontaneously, it is more frequently the sequel of an imperfectly cured acute attack; in the second, it depends upon granules (supposed by Louis and most writers to be tubercles) lying in countless numbers in the serous membrane, and serving as a constant source of irritation. The second form is confined almost, if not entirely, to persons of a scrofulous constitution.

The symptoms of chronic peritonitis are more obscure than those of the acute form. There is abdominal pain, often slight, and not always constant, which is increased by pressure, or sometimes is felt only when pressure is made. The patient complains of a sensation of fullness and tension of the belly, although its size is not visibly increased; of a loss of appetite; and of nausea and vomiting; and the bowels are usually more or less out of order. After a time, the abdomen enlarges, and becomes tympanitic, or more or less filled with fluid; and death gradually ensues from debility and emaciation, unless the fatal issue is accelerated by an acute inflammatory attack.

It is not always easy to determine, during life, whether the disease belongs to the first or second form. When its origin cannot be traced to a preceding acute attack, to local abdominal injury, or to chronic affections of the abdominal viscera, there is strong reason to believe it to be of the granular, or, as it is commonly called, the tubercular form, especially if the general constitution and the hereditary tendencies of the patient point in the same direction.

Little can be done in the way of treatment, especially in the tubercular form, further than mitigating the most distressing symptoms, and possibly retarding the final issue. The frequent application of a few leeches to the abdomen, followed by warm poultices, occasional blisters, attention to the bowels, which, if costive, should be acted upon by gentle laxatives, and a mild, nourishing, but unstimulating diet, are more likely to be of service than remedies of a more energetic nature.

PERITYPHLITIS. An inflammation of the loose connecting tissue attaching the cæcum and ascending colon to the iliac fascia. See CÆCUM; COLON; VERMIFORM APPENDIX.

PERIWINKLE, *Littorina*, a genus of gasteropodous mollusks of the order *pectinobranchiata* and family *littorinidæ*, having a proboscis-shaped head, a foot of moderate size, a single gill, and a rudimentary siphonal canal; the shell turbinate, thick, with few whorls, and no nacreous lining, the operculum of few whorls. A very well-known species is the COMMON PERIWINKLE (*L. littorea*), a snail-like mollusk most abundant on rocky parts of the British coasts, living in the lowest zone of sea-weeds between tide-marks, and feeding on fuci, etc. It is oviparous. No mollusk is more generally collected and used for food. Children are generally employed in collecting it. It is boiled in the shell, and so sold, often on the streets, and chiefly to the poorer classes, although few mollusks are more pleasant. It is calculated that 1900 tons, value £15,000, are annually consumed in London alone. It is called *wilk, wulk,* or *whulk* in Scotland, but is quite different from the *whelk* (q.v.) of the English.

PERIWINKLE, *Vinca*, a genus of plants of the natural order *apocynaceæ*, having a 5-cleft calyx, and a salver-shaped corolla, bearded at the throat, with five obliquely truncated segments. The leaves are opposite and evergreen; the flowers grow singly or in pairs from the axils of the leaves. The LESSER PERIWINKLE (*V. minor*), a native of many parts of Europe, and of the southern parts of Britain, growing in woods and thickets, is a half-shrubby plant with trailing stems, rooting at their extremities, ovato-lanceolate leaves, and pale-blue—sometimes white or reddish-purple—salver-shaped flowers. The GREATER PERIWINKLE (*V. major*), which has much larger flowers and ovato-cordate ciliated leaves, is a native of the south of Europe, and is found in a few places in the south of England. Both of these species are very commonly planted in shrubberies and gardens, rapidly cover unsightly objects with pleasing green foliage, and produce their beautiful flowers at almost all seasons of the year, even in winter when the weather is mild. The HERBACEOUS PERIWINKLE (*V herbacea*), a Hungarian species, is remarkable for the abundance of its flowers. The YELLOW PERIWINKLE (*V. lutea*) is a native of the southern parts of North America. The ROSE-COLORED PERI-

WINKLE (*V. rosea*), a native of Madagascar, is a favorite greenhouse plant.—The name periwinkle was formerly *perwinké*. Chaucer speaks of the "fresh perwinké rich of hue." It is probably from the French *pervenche*, and that from the Latin *vinca*.

PERJURY is the crime committed by one who, when giving evidence on oath as a witness in a court of justice, or before some constituted authority of the same kind, gives evidence which he knows to be false. But in order to make the giving of the false evidence liable to criminal punishment, it must have been not only false to the knowledge of the witness, but the matter must have been material to the issue raised. If the falsehood occurred as to some trifling or immaterial fact, no crime is committed. Moreover, it is necessary, in proving the crime, that at least two persons should be able to testify to the falsehood of the matter, so that there might be a majority of oaths on the matter—there being then two oaths to one. But this rule is satisfied though both witnesses do not testify to one point. The perjury must also have taken place before some court or tribunal which had power to administer the oath. See OATH. Though in some courts affirmations are allowed instead of oaths, yet the punishment for false affirmation is made precisely the same as for false swearing. The punishment in England was, before the Conquest, sometimes death or cutting out the tongue ; but latterly, it was confined to fine and imprisonment, and at present the latter is the only punishment, with the addition of hard labor. The crime of subornation of perjury—i.e., the persuading or procuring a person to give false evidence, is also punishable as a distinct offense.

PERKINS, ELISHA, 1741–99 ; born, Conn. He was the inventor of what were called Perkins's *tractors*, which at the commencement of this century were used by him, and by itinerant practitioners of medicine, as well as by some of the regular medical profession, for the treatment of rheumatism, neuralgia, and local inflammations. The instrument, or instruments—for they consisted of two bars of metal or pins, or whatever the apparatus may be called—was made of brass and iron, containing, as the inventor pretended, peculiar combinations of metals. Their use consisted in drawing them in a certain manner over the affected parts. The practice was called "Perkinsism," and obtained for a time a remarkable number of proselytes in this country, but especially in Europe. In London the practice was introduced by Perkins's son, and a Perkinsian institution, with lord Rivers as president, was established for the benefit of the poor. Five thousand cures were published, with the certificates of eight medical professors, forty physicians and surgeons, and thirty clergymen. In Copenhagen twelve physicians and surgeons, most of them instructors in the Royal Frederick's Hospital, made a "series" of experiments, which were published in an imposing octavo volume with a report in favor of the "system." In a few years, however, the tractors, as was inevitable, fell into disrepute, as their use did not justify their reputation. Perkins afterwards invented a fever medicine whose efficacy he undertook to demonstrate during the prevalence of yellow fever in New York in 1799, but after four weeks of toil he himself contracted the disease and died. It is not improbable that in some cases, where the tractors were used with some degree of pressure, they may have afforded some relief by the mechanical stimulus they supplied, similar to that afforded by manual rubbing and kneading, but, of course, in a much less degree. The benefits of exercise and motion in the treatment of diseases were not at that time appreciated as they are now; and as some improvement may have occasionally followed the use of the tractors, the therapeutics of which was not understood, it was concluded that they must possess certain inherent curative properties.

PERKINS, GEORGE ROBERTS, LL.D., 1812–76; b. N. Y.; taught mathematics at Clinton, 1831–38, when he became principal of the Utica academy. He was professor of mathematics at the state normal school, 1844–48 ; then was appointed its principal. In 1852 he took charge of the erection of the Dudley observatory, and in 1858 was made surveyor of the state. Among his publications are a series of arithmetics: *Treatise on Algebra*, 1841; *Elements of Geometry*, 1847; *Trigonometry and Surveying*, 1851; and *Plane and Solid Geometry*, 1857.

PERKINS, JACOB, 1766–1849 ; b. Mass.; during his apprenticeship with a goldsmith he invented a new method of plating shoe-buckles. In 1787 he made dies for the Massachusetts mint; also, he invented steel plates for bank-notes, and a machine for cutting and heading nails. In 1818 he went to England, and for a number of years afterwards was engaged in furnishing the bank of Ireland with plates. Among his inventions were the steam gun, and the bathometer, for measuring the depth of water. He was the first to prove the compressibility of water.

PERKINS, JUSTIN, D.D., 1805–69 ; b. Mass.; graduated at Amherst college in 1829; studied theology at Andover ; was tutor at Amherst, 1832–33; embarked at Boston, Sept. 21, 1833, as a missionary of the American board; reached Tabriz in 1834; and established the Nestorian mission at Oroomiah, Persia. He immediately engaged Mar Yohanna as his Syriac teacher. He was joined by Dr. Grant in 1835. Schools for boys and girls were established which have become flourishing seminaries. Besides these higher schools there are 70 primary schools, in which 3,000 Scripture readers have been educated, and many trained to preach the gospel. Dr. Perkins translated the Bible and several religious books into Syriac. In 1842 he returned to the United States, accompanied by Mar

Yohanna, the Nestorian bishop, whose presence and addresses awakened a deep interest in the mission. Dr. Perkins returned to Persia with Stoddard and other missionaries, laboring successfully until 1869, when with impaired health he returned to his native country, where he died. He published *Syriac Commentaries on Genesis and Daniel; Eight Years in Persia; Missionary Life in Persia.* He contributed also to the *Bibliotheca Sacra,* and to the *Journal of the American Oriental Society.*

PERKINS, Thomas Handasyd, 1764–1854; b. Boston; entered into partnership with his brother James in St. Domingo, but was compelled to leave by the insurrection of the blacks. In 1789 he went to Batavia and Canton, and familiarized himself with the Chinese and East Indian trade. He was in partnership with his brother James till 1822, and acquired a large fortune. He was for many years a member of the Massachusetts legislature, in either the senate or house. He was one of the originators of the Quincy railroad, one of the first in the United States; founded the Perkins asylum for the blind, contributed liberally to the Bunker Hill monument, and was one of the chief benefactors of the Boston athenæum and the Massachusetts hospital.

PERKIN WARBECK. See Henry VII.

PER'LEBERG, a t. of Prussia, province of Brandenburg, on the Stepenitz, with manufactures of wax, soap and mustard, etc. Pop. '95, with garrison, 8180.

PERM, the most eastern government of European Russia, is bounded on the e. by Siberia, and on the n., w. and s. by the governments of Vologda, Viatka, and Orenburg respectively. Area, 128,210 sq. m.—more than twice the area of England and Wales. Pop. '94, 2,941,337. It is divided by the Ural mountains into two unequal parts, of which the smaller portion is on the eastern or Siberian side of the mountains, although, for administrative purposes, it is reckoned as a part of European Russia. About three-fourths of the government are occupied by the Ural range, which reaches on a maximum 3600 ft.; but which slope so gradually toward the plain, that the traveler reaches their summit before he is aware that he has made any unusual ascent. About two-thirds of the entire surface, comprising all the northern districts, are covered with forests, one-tenth of the area is in meadows, and about the same extent is under cultivation. The more important rivers belong to the systems of the Volga and the Obi. The Kama, together with the Tshousovaia and other affluents from the Ural mountains, flow s.w., join the Volga, and thus form an important means of communication between the mining districts of Perm and Europe. The Tura, the Sosva, and the Losva communicate with the Obi; and access is opened up to the White sea and the Arctic ocean by the rivers Dwina and Petchora. The climate is healthy, though somewhat rigorous. At the end of July the nights are cold; in the middle of September falls the first snow. In November, when the whole face of nature is covered with snow, the transport of goods by sledges is busily carried on everywhere. In January the cold is so great that quicksilver sometimes freezes. At the end of March the snow begins to melt, and before the middle of May, although the cold is still great, the country is clothed in the green of early spring. The mines, the most important of Russia, are of gold, copper, magnetic iron ore, rock crystal, jasper, agate, topaz, porphyry, malachite, porcelain clay, salt (obtained from salt springs), coal, alabaster, marble, etc., and diamonds in small quantities. The inhabitants are chiefly Russians, but there are also numbers of Tartars, Bashkirs, and Finns. The agricultural produce of the government, consisting chiefly of corn, vegetables, flax, and hemp, is more than sufficient for local consumption, and is exported to some extent to the neighboring governments. The immense forests of the country yield wood for fuel, and timber for the construction of the barges which, during summer, are floated down the rivers, freighted with the products of the mines. 40,000,000 acres of the government are covered by forest; agriculture, especially in the south, is carried on extensively. The numerous mines employ over 100,000 hands, and recently their annual produce was estimated at 2,688,000 oz. of gold, 650 tons of copper, and 250,000 tons of pig iron. Here, also, are to be found rare metals, such as iridium, osmium, etc. The iron of Perm is famous all over Europe. The commerce of the government is very considerable. The fair of Irbit (q. v.) is, after that of Nijni-Novgorod, the most important in the Russian empire. The transit trade, however, is much more considerable than the local trade. The North Siberian railway from Perm and Berezniki passes to Chusovaya, and the government communicates by means of the Volga, Petchora, and the Obi with the Baltic, White, and Caspian seas. The central administration of mines has its seat in Ekaterinburg.

The government of Perm once formed a portion of the ancient Biarmia, inhabited in the earliest historical times by Finnish tribes, and even then famous for the commerce which it carried on, especially with Asia. In the 11th c., it became connected commercially with the principality of Novgorod, which, little by little, conquered and took possession of the country. At the close of the 15th c., both it and Novgorod were annexed to the territories of the prince of Moscow, but as early as the 12th c. the Christian religion had been introduced.

PERM, a t. of European Russia, capital of the government of the same name, on the Kama, and starting point of the North Siberian railway. It was founded in 1729, under the name of the Egotinsky copper-work, and was the first colony in the government from which it derives its name. It is the chief depot for the transport of convicts and

exiles to Siberia and is the seat of a most extensive transit trade. Here goods floated down the Tshousovaia from the Ural mountains, are transferred to larger vessels, and forwarded by the Kama and Volga past Nijni-Novgorod and Rybinsk, and thence to St. Petersburg. Goods from the sources of the Kama, metals, corn, tallow, and leathers, as well as Siberian and Chinese articles, are also sent from Perm to the Russian interior, and to Europe generally. It contains machine works and manufactories for rope, candles, soap and china. Pop. '91, 38,261.

PERMANGANATES, compounds of permanganic acid with bases. If to potassium manganate, free from excess of alkali, a large quantity of water is added, and the solution boiled, it is decomposed into manganese dioxide and potassium permanganate, which latter remains in solution while the dioxide is precipitated. The following equation represents the reaction:

$$3K_2MnO_4 + 2H_2O = MnO_2 + K_2Mn_2O_8 + 4KOH.$$

Remarkable changes of color accompany the decomposition, on which account this permanganate has been called *mineral chameleon*. Excess of alkali in the manganate confers more stability upon it, retarding the decomposition. On a large scale permanganate of potash is made by mixing equal parts of finely powdered manganese dioxide and potassium chlorate with rather more than one part of caustic potash dissolved in a little water, evaporating to dryness, and then heating to a point just below ignition. This mass is then treated with hot water, the insoluble oxide separated by decantation, and the purple liquid concentrated by evaporation until crystals form upon the surface. It is then left to cool and complete the process of crystallization. The crystals have a dark purple color and are not very soluble in water. The manganates and permanganates are decomposed when brought into contact with organic matter. The manganates are isomorphous with the sulphates, whilst the permanganates are isomorphous with the perchlorates. Condy's disinfecting fluids, sold in the drug shops, are alkaline manganates and permanganates. Hydrogen permanganate, or permanganic acid, $H_2Mn_2O_8$, is obtained by adding finely pulverized potassium permanganate to well-cooled, concentrated sulphuric acid, H_2SO_4. The acid is a reddish brown oily liquid, very unstable, giving off violet vapors, and decomposing with explosion on being heated. It has a strong attraction for moisture and for organic matter, setting fire to paper, etc., and to alcohol. Water is colored by a small amount of the permanganates, and such solutions are very delicate tests for deoxidizing matters, because these latter destroy the color by reducing the permanganate. A weak solution of a permanganate is used in the laboratory for determining the amount of oxidizable substances. The contaminations of drinking waters produced by septic fermentation are easily detected by using permanganates as reagents, and it is in consequence of their great oxidizing power that the permanganates are good disinfectants.

PERMIAN, MAGNESIAN LIMESTONE, or Dias group, is the lower division of the new red sandstone rocks, which were separated, chiefly on paleontological grounds, from the upper portion, and being, in 1841, without a collective name, were called Permian by Murchison, because he found them largely developed in that portion of Russia which composed the ancient kingdom of Permia, or Biarmia. The name magnesian limestone is given to them because of the predominant deposit; and dias has been proposed by some German geologists, to correspond with trias, the name universally accepted for the upper section of the new red sandstone series.

The Permian strata occupy in Russia an area twice the size of France, and contain an abundant and varied suite of fossils. They are also largely developed in Germany, and as they have been there carefully studied and described by numerous geologists, the rocks of that country may be considered as the types of the group. They have been thus grouped: 1. Bunterschiefer. 2. Zechstein. 3. Kupferschiefer or Mergel. 4. Rothe-todtliegende.

The bunterschiefer consists of red and mottled marl and sandstone, which have been separated from the triassic bunter sandstein, because of the occurrence in them of fossils which have a paleozoic facies. The zechstein is chiefly a compact limestone with beds of colored clays, and cellular magnesian limestone. The well-known stinkstein belongs to this series; it is a dark-colored and highly bituminous limestone, which gives out an offensive odor when struck or rubbed. The name zechstein (literally, minestone) was given to these beds, because they must be mined or cut through to reach the kupferschiefer below. This latter is a marl slate, richly impregnated with copper pyrites, for which it was extensively wrought. It contains numerous beautifully preserved fossil fish belonging to the genera palæniscus, cælacanthus, platysorus, etc. The strange name of rothe-todtliegende (red dead-layers) was given to a large deposit of red sandstone and conglomerate, by the miners, because the copper obtained from the beds above died out when they reached these red rocks.

The succession of rocks given by Murchison as occurring in Permia are easily co-related with those of Germany. They are (1), conglomerates and sandstones, containing the remains of plants; (2), red sandstones and shales, with copper ore and vegetable remains; and (3), sandstones, grits, and fossiliferous limestones, with interstratified beds

of marl and gypsum, the marls occasionally containing plants and also seams of impure coal.

In England the Permian rocks are somewhat extensively developed in Durham, where they have been described by Sedgwick and King. From this county they continue in a narrow strip bordering the carboniferous beds down the center of England until they are lost near Nottingham. In Cheshire, Shropshire, Stafford, and Warwick, they underlie the salt-bearing triassic rocks. The Durham strata are grouped as follows:

1. Concretionary and amorphous limestone.....
2. Brecciated and pseudo-brecciated limestone..... } =Bunterschiefer.
3. Fossiliferous limestone.....
4. Compact limestone..... } =Zechstein.
5. Marl slate..... =Kupferschiefer.
6. Inferior various-colored sandstone..... =Rothe-todtliegende.

The fractured bones and teeth of saurians found in the basement bed of the sixth group were considered the earliest evidence of the existence of reptiles until the discovery of the archegosaurus in the carboniferous rocks.

The known organic remains of this period are neither remarkable nor abundant. Many paleozoic forms became extinct within this period; among them are the remarkable sigillaria and the neuropteris of the coal-beds, the well-known brachiopod, producta, and several genera of heterocercal-tailed fish. Some new forms appear, the most important of which are the labyrinthodont reptiles, which, though beginning in the upper carboniferous beds, increase in number in the Permian, and reach their maximum development in the succeeding triassic group.

PERMUTA'TIONS AND COMBINA'TIONS. A combination, in mathematics, is a selection of a number of objects from a given set of objects, without any regard to the order in which they are placed. The objects are called elements, and the combinations are divided into classes, according to the number of elements in each. Let the given elements be the four letters *a, b, c, d;* the binary combinations or selections of two are *ab, ac, ad, bc, bd, cd*—six in all; the combinations of three are *abc, abd, acd, bcd*—four in all; while there is only one combination of four, namely, *abcd.*

Permutation, again, has reference to the order of arrangement; thus, the two elements *a* and *b* may stand *ab* or *ba,* so that every combination of two gives two permutations; the three elements *a, b,* and *c* may stand *abc, acb, bac, bca, cab, cba,* one combination of three thus affording six permutations. The combinations of any order with all their permutations are called the *variations.* Formulas are given in works of algebra for calculating the number of permutations or combinations in any given case. Suppose seven lottery-tickets marked 1, 2, 3, to 7, and that two are to be drawn; if it is asked how many possible pairs of numbers there are, this is a question of the number of combinations of seven elements, *two* together, which is found to be 21. If we want to know how many times the same seven persons could sit down to table together with a different arrangement each time, this is to ask how many permutations seven objects admit of, and the formula gives $7 \times 6 \times 5 \times 4 \times 3 \times 2 = 5{,}040$. The theory of probabilities is founded on the laws of combination. Thus, in the case of drawing two tickets out of seven, since there are 21 possible pairs, the chance or probability of drawing any particular pair is 1 in 21, or $\frac{1}{21}$. In working out questions in "combinations," advantage is often taken of the fact that whatever number of elements be *taken* from a group to form a combination, the number *left* gives the same number of combinations; thus the number of combinations of 10 elements *three* together, is the same as that of 10 elements *seven* together, etc.

PERN. See HONEY BUZZARD.

PERNAMBU'CO, a maritime province of Brazil, is bounded on the s.e. by Bahia and Alagoas, and on the n.w. by Piauhi, Ceara, and Parahiba. It contains 49,575 sq. m., and '90, a population of 1,101,539. The coast is flat, and fringed with coral reefs, which render navigation dangerous. The chief river is the San Francisco, which forms the southern boundary, and includes the greater portion of the area of the province in its basin. The banks of this river comprise many rich, expansive meadows, and here the cattle are reared which, in the form of beef and hides, form an important article of export at the seaport of Pernambuco. Much of the cotton and sugar brought to the market of the capital is harvested in regions fertilized by streams that rise at the base of the Santa Barbaretta hills, the first hill-range in this district that arrests the trade-wind from the Atlantic, laden with rain. Five railways connect the capital and the interior and have done much to encourage the cultivation of sugar and cotton. The coast region comprises immense tracts of rich and fertile soil, productive in sugar-cane, cotton, maize, fruits, vegetables, and medicinal herbs, but the western part is almost desert. From the forests, balsams, gums, and dye-woods are obtained.

PERNAMBU'CO, or RECIF'E, the most eastern seaport of Brazil, stands at the mouths of the Biberibe and Capeberibe, in lat. 8° 5′ s., long. 34° 52′ w., 80 m. s. of Parahiba. It is the greatest sugar-mart in Brazil, and is the third in commercial importance of the cities of the empire. It consists of 3 portions, connected by roads and bridges, — *Recife*

proper, the chief seat of commerce, on a peninsula; *S. Antonio*, the middle and principal district, on an island between the peninsula and the mainland; and *Bõa Vista*, on the mainland, which is the newer residential quarter. The inner harbor, which has a depth of from 24 to 33 ft., is formed by a reef which extends along the coast at a distance of from a quarter to half a mile from the coast. This reef serves the purposes of a breakwater. Opposite the northern extremity of the city there is an opening in the reef, resembling an artificial cut, and forming a passage of sufficient width to admit of the entrance of vessels drawing 16 ft. of water. No port is more easily accessible than the outer harbor of Pernambuco. There is a light-house in the harbor, and it is defended by several forts. Formerly the city was an English, and then a Dutch colony, but in 1654 fell into Portuguese hands after being greatly enlarged by Count Maurice of Holland. An observatory, arsenal, parliament house, etc., have been established, and the growing wealth and commercial prosperity of the city have been accompanied by an increasing degree of comfort and refinement. The principal exports are sugar, cotton, rum, hides, and dyewoods. The imports are woolen and cotton goods, provisions, and minerals, etc. The annual values of exports average 1 to 2 millions sterling. Pop. 1892, 190,000.

PERNAMBUCO WOOD. See BRAZIL WOOD.

PÉRNOW′ (Germ. *Pernau*), a seaport of the Baltic provinces, Russia, in the government of Livonia, stands on a sandy heath at the mouth of a river of the same name, on the gulf of Riga, 55 m. n. by e. of Riga, and 350 m. w.s.w. of St. Petersburg by sea. Pernow is a well built town founded in 1255 and annexed by Russia in 1710, and was fortified until the 16th century. There is an average depth of 12 ft. on the bar and good anchorage in the roads. The exports are chiefly flax, linseed; the principal imports are fish and coal. Pop. '91, 13,556.

PÉRONNE, a fortified t. in the dept. of the Somme, France, on the Somme river, abt. 94 m. n.e. of Paris. It has manufactories of sugar, oil, beer, etc. It was bombarded and forced to capitulate during the Franco-Prussian war, 1870–71, and was almost destroyed, but has since been rebuilt. It contains buildings which date back to the middle ages. Pop. comm. 4746.

PERONOSPHOR′EÆ, an order of fungi having ærial conidia. It includes only two genera, and the species are, with only one exception, parasites of living herbs. They have the appearance of white frost, and are usually found on the under side of the leaves. The order includes fungi which attack unsound potatoes, lettuce, cabbage, mustard, and the grape-vine. The mycelium penetrates all parts of the plant, even to the flowers, but spreads much more rapidly in damp than in dry weather.

PE′ROUSE, LA. See LA PE′ROUSE.

PERPENDICULAR. A straight line standing on another straight line is said to be perpendicular to that other when the angles it makes on both sides are equal (see ANGLE). A line is said to be perpendicular to a plane when it is at right angles to any line in that plane meeting it. Planes are said to be perpendicular to each other when any line in the one plane perpendicular to their common line of intersection is also perpendicular to all lines meeting it in the other plane.

The word "perpendicular," in common usage, refers to a direction at right angles to the surface of still water, and is synonymous with vertical.

PERPENDICULAR, the name given to the style of Gothic architecture in England which succeeded the decorated style. It prevailed from about the end of the 14th c. to the middle of the 16th c., and was thus contemporary with the flamboyant style in France. These styles have much in common, but they derive their names from the features peculiar to each. Thus the flamboyant (q.v.) is distinguished by the flowing lines of its tracery; whilst the perpendicular is remarkable for its stiff and rectilinear lines. The lines of the window-tracery are chiefly vertical, and the mullions are frequently crossed by horizontal bars. The moldings are usually thin and hard. The same feeling pervades the other features of the style; the buttresses, piers, towers, etc., are all drawn up and attenuated, and present in their shallow recesses and meager lines a great contrast to the deep shadows and bold moldings of the earlier styles. The art of masonry was well understood during the perpendicular period, and the vaulting was admirably built. Fan-tracery vaulting (q.v.) belongs to this style. The depressed or four-center arch is another of its peculiar features. This arch, over doorways, has the moldings generally arranged in a square form over th earch, with spandrels containing shields, quatrefoils, etc. Paneling was also much used, the walls being frequently almost entirely covered with it, as in Henry VII.'s chapel at Westminster. There are many well-known buildings of this style. Most of the colleges at Oxford and Cambridge belong to it, and in almost every cathedral and church of importance there are some specimens of it. Open timber roofs are very common in the perpendicular style, and are amongst the peculiar and beautiful features of the architecture of this country. The roof of Westminster hall, built by Richard II., is the largest example ever erected.

PERPENDICULAR FORTIFICATION owes its origin to the marquis de Montalembert, a distinguished French gen., who published his work upon the subject in 1776. Vauban had, it was admitted, rendered the art of attack superior to that of defense. Montalembert strove to reverse this relation, and, in his endeavors, rejected entirely the bastion system of the older engineers. Instead of the occasional bastions, with intervening curtains (see FORTIFICATION), with which they surrounded their *enceinte*, he broke the whole polygon into salient and re-entering angles, the latter being generally right angles. Before the connected redans thus formed were counter-guards of low elevation and ravelins, to which the approaches were through casemated *caponnières*. In the salient angle of each redan, he built a brick tower, 40 ft. in diameter, twelve-sided, and four stories high. The second and third tiers were built for heavy guns, and the upper loopholed for musketry. In the center of the tower was a circular *réduit*, intended as a last refuge for the garrison. Montalembert maintained that from these towers every possible approach could be commanded, which to a great extent is true; but it must be also remembered that the greater space a gun commands, by so much the more is it raised above the plain, and rendered visible. These towers would have little chance against the rifled ordnance of the present day. Montalembert's system was violently attacked by the French engineers, but Carnot subsequently adopted it, with some modifications, and it enters largely into the modern German defensive works. The system has never, however, found favor with other engineers.

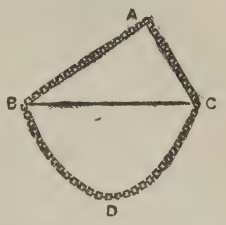
PERPETUAL CURE, a form of ecclesiastical benefice which grew out of the abuse of lay impropriation (q.v.), the impropriator appointing a clergyman to discharge the spiritual functions of which he himself was not capable. The substituted clergyman, in ordinary cases is appointed by the bishop, and called a vicar; but when no provision is made for a vicar the impropriator appoints the clergyman, who is called a perpetual curate. The perpetual curate enters on his office without induction or institution, and requires only the bishop's license. Perpetual cures are also created by the erection and endowment of a chapel subject to the principal church of a parish. Such cures, however, are not benefices unless endowed out of the fund called queen Anne's bounty. Churches so endowed are, by 2 and 3 Vict. c. 49, recognized as benefices. The district churches which have been erected under several recent acts are made perpetual cures, and their incumbents are corporations.

PERPETUAL MOTION, THE. According to Newton's first law (see MOTION, LAWS OF), all unresisted motion continues forever unchanged. Thus, *if friction could be avoided*, a top or a gyroscope spinning in vacuo is an instance of motion which would be unchanged forever, and which, therefore, might be called perpetual. The motion of the sun in space, the earth's rotation about its axis, and numerous other common motions, are in this popular sense perpetual. [It is necessary to remark here, that even these motions are subject to retardation; for instance, those of the bodies of the solar system, by the resistance of the luminiferous medium, which we know to be matter, and which fills all space. This was remarked by Newton himself, for he says, "The larger bodies, planets, and comets, preserve their motions longer (than terrestrial objects), because they move in less resisting media." The same cause influences the motion of the gyroscope, but in its case there is another retarding influence at work, due to the production of electric currents by the magnetism of the earth.] But this is not what is technically understood by the title *The Perpetual Motion*. It means an engine which, without any supply of power from without, can not only maintain its own motion forever, or as long as its materials last, but can also be applied to drive machinery, and therefore to do external work. In other words, it means a device for creating power energy without corresponding expenditure. This is now known to be absolutely impossible, no matter what physical forces be employed. In fact, the modern physical axiom, the conservation of energy (see FORCE), founded on experimental bases as certain as those which convince us of the truth of the laws of motion may be expressed, in the negative, thus: *The perpetual motion is impossible.* Helmholtz's beautiful investigations regarding conservation of energy (referred to in FORCE), are founded on this axiom. So is the recent application, by Clausius, of Carnot's remarkable investigation of the "motive-power of fire," to the true theory of heat. Other instances will be mentioned at the end of the article.

The complete statement of the impossibility of procuring perpetual motion with the ordinary mechanical arrangements, in which it was commonly sought, is found in the *Principia* (see NEWTON, SIR ISAAC), as a deduction from Newton's third law of motion. The equivalent principle of conservation of energy is there stated in a manner which leave nothing to be desired; although not given in anything like the modern phraseology. Yet it is usually said, in works on perpetual motion, that De La Hire (in 1678) gave the first proof of its impossibility in ordinary mechanics. This proof, published long after Newton's, is by no means so complete, as it exposes only some of the most patent absurdities which had been propounded for the solution of the problem. It is certain, and worthy of particular notice, that Newton was far in advance of the greatest of his contemporaries and their immediate successors, in even the fundamental notions of mechanics. Thus we find John Bernouilli seriously propounding a form of the perpetual motion, depending upon the alternate mixture, and separation by a filter, of two liquids of different densities; an arrangement which is as preposterous as the very common suggestion

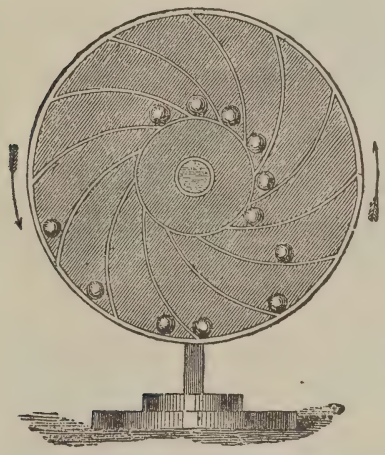
of a water-wheel which should pump up its own supply of water; and whose absurdity must be evident to any one acquainted with Newton's chapter on the laws of motion.

It is curious that, long before Newton's time, the physical axiom that the perpetual motion is impossible was assumed by Stevinus as a foundation for the science of statics. This is particularly interesting when we compare it with the magnificent discoveries which have been evolved in our own day from the same principle applied to the physical forces generally, and not to gravitation alone, as contemplated by Stevinus. His process is as follows: Let an endless chain of uniform weight be passsed round a smooth triangular prism ABC, of which the face BC is horizontal. The free portion of the chain BDC will hang in a symmetrical curve (CATENARY, q.v.), and its tension will therefore be the same at B and at C. Hence the other portion BAC of the chain will be free to move, unless the resolved part of the weight of AB, acting down the inclined plane AB, just balance that of the corresponding portion of the chain down AC. If these balance, the parallelogram of forces is proved; if not, one side will preponderate, and we shall evidently obtain the perpetual motion.

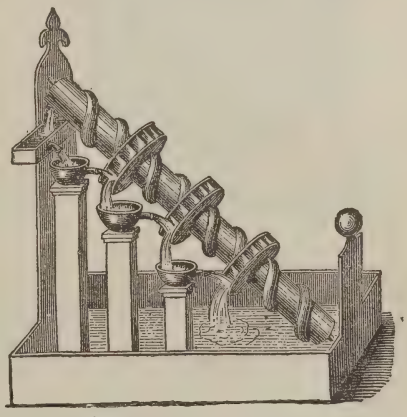


We will briefly sketch the history of the simpler part of the problem, where mechanical and hydrostatical arrangements alone are contemplated, and where the impossibility of procuring the perpetual motion had been completely shown by Newton.

The leading features of the various devices suggested as self-moving engines are three: 1. The machine being a combination of mechanical powers driven by weights, was to be constructed so as constantly to wind up those weights as they fell, and therefore to be constantly in the same circumstances as to power in each successive complete revolution. The ideal of this, in its simplest form, is that of a wheel moving about a horizontal axis, and so adjusting certain heavy sliding pieces on its surface as to have always a preponderance on one particular side. 2. The type of the second class differs



Merlin's Perpetual Motion.



Bishop Wilkins's Third Form

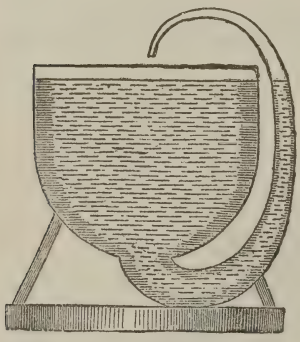
from that of the first only in the substitution of liquids for the weights in the first class, and the consequent introduction (often in most extravagant forms) of hydrostatical laws, which the inventors seem to have considered less certain and more pliable than the stern facts of common mechanics. 3. The machine depends on some natural power, such as rain, change of temperature, wind, fluctuations of the barometer, tides, etc. The consideration of this third class is very interesting, but we will defer it for a little.

Of the first class, the only machines that seem ever to have succeeded in permanently deceiving any but their inventors are those of the marquis of Worcester and of councilor Orffyreus. Contemporary with the former was bishop Wilkins, who candidly and ingeniously points out the fallacies of various devices of his own, depending severally on weights, on magnets, and on Archimedes's screw. His first attempt seems to have been closely allied to that of the marquis of Worcester, of whose engine we have no drawing, and only a very vague description. The following figure gives us, however, some notion of its probable nature. In Wilkins's and Jackson's perpetual motions, levers were used instead of balls.

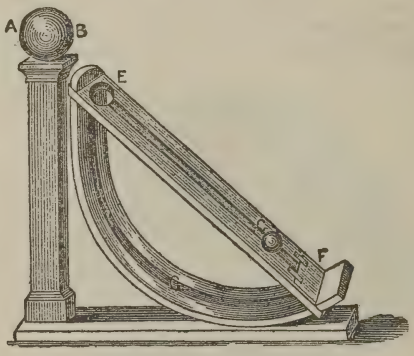
In all three, the attempt is by the sliding of the balls in their cells, or by the turning of the levers, to give the preponderance to the descending side of the wheel. But even

the cut shows that, though the weights on the descending side are on the whole further from the axis of the wheel than those on the ascending side, yet *there are more balls* on the latter than on the former side; and a careful examination, like that made by Wilkins, shows that their moments in opposite directions about the axis balance each other With reference to the invention of the marquis of Worcester—who is otherwise well known as one of the first to foresee, and even in part to realize experimentally, the advantage of steam as a motive-power—we find the following in his *Century of Inventions:* "*An Advantageous change of centers.*—To prouide and make that all ye weights of ye descending syde of a wheele shal be perpetually further from ye center, then those of ye mounting syde, and yett equall in number and heft of ye one syde as ye other. A most incredible thing if not seene, butt tryed before ye late king of happy and glorious memorye in ye Tower by my directions, two extraordnary embassadors accompanying his Matie and ye D. of Richmond, D. Hamilton, and most part of ye court attending him. The wheele was 14 foote ouer, and 40 weights of 50 p^d^ apiece; S^r^ Wm. Belford, then Lieu^t^ of ye Tower, and yet liuing can justify it with seuerall others; They all saw that noe sooner these great weights passed ye Diameter Line of ye vpper syde but they hung a foote further from ye center, nor no sooner passed the Diameter Line of the lower syde, butt they hung a foote nearer; bee pleased to judge ye consequence."*

The machine of Orffyreus, by which 'S Gravesande was completely deceived, so much so that he wrote to Newton expressing his belief that the perpetual motion was really found, consisted of a large wheel or drum covered with canvas, to prevent the interior from being seen, and rotating about a thick horizontal axle. This machine, when set agoing in either direction, moved with accelerated speed till it reached a rate of twenty-five turns in a minute; and on one occasion was sealed up by the elector of Cassel for two months, and at the expiration of that time found to be moving as rapidly as ever.



Norwood's Perpetual Motion.



Bishop Wilkins's Second Form.

This, like the celebrated automaton chess-player, was evidently a case of clever imposition; and but for its strange effect on 'S Gravesande, would probably have been forgotten long ago. Tricks of this kind, more or less ingenious, such as that of Spence of Linlithgow (1818), which many of our readers may recollect, are still common, especially in America.

Bishop Wilkins's third form is a good example of the second class of contrivances above mentioned. Three water-wheels, driven by the descending water, are intended to turn an Archimedean screw, so as constantly to replenish a tank above. Wilkins's calm investigation of the reasons why his device will not succeed is very interesting and creditable.

As a contrast, let us take a case of special absurdity, that of Norwood. In the figure, it is supposed that, as the weight of the water or mercury in the large vessel immensely exceeds that in the neck, it will preponderate, and drive the liquid through the spout into the vessel again; thereby furnishing, not only an admirable perpetual motion, but a conclusive disproof of one of the fundamental laws of hydrostatics.

The second of Wilkins's cases is an instructive one. It depends on magnetism, and will be readily understood from the cut. AB is a loadstone, which draws the iron ball, C, up the inclined plane to E, where there is a hole through which the ball falls down the curved incline, pushes open a trap at F, and is dragged again up the plane by the loadstone. The error of this is the neglect of the action of the loadstone on the falling ball. There would be an admirable case of the perpetual motion if we could remove or annihilate (without expenditure of work) the action of the loadstone during the descent. Unfortunately, the law of magnetic attraction is the same as that of gravitation, and what is impossible with the one must be equally so with the other. A good illustration

* See Harleian MS., No. 2,428, in the British Museum.

of this is Addeley's perpetual motion, represented in the annexed sketch. The spokes projecting from the wheel are magnets, whose south poles are all turned from the center. These are attracted by the north poles (N), and repelled by the south poles (S) of four fixed magnets; and blocks of *wood* (A) are interposed, to *prevent* magnetic action where it would tend to stop the machine! If it were possible to find a substance which would deal with gravitation or magnetism as an opaque body does with light (casting a shadow), the perpetual motion would be obtained with the greatest ease.

Addeley's Perpetual Motion.

It would be tedious and unprofitable to go through the various physical forces, showing how a misconception of their laws has led to hundreds of patented schemes for the production of perpetual motion. We may merely hint at magneto-electric machines turned by electro-magnetic engines, to which they supply the electric currents; electric machines, driven by a gas-engine, the fuel for which is supplied by the decomposition of water by the electricity produced, etc.; the absurdity of all of which may be imagined from the perfectly analogous case of a steam-engine to which heat might be supposed to be supplied by the friction of bodies driven by the engine itself. An excellent example of this absurdity is furnished by the writings of one of our ablest geologists. He considers that the internal heat of the earth may be due to chemical combination, that the heat so produced may develop thermo-electric currents, and that these in their turn may decompose the compounds formed, so that the process may go on indefinitely.

But the third class of attempts above described merits a few words. It certainly does *not* give the perpetual motion, but it is capable of furnishing prime-movers which will work uninterruptedly for perhaps hundreds of thousands of years. This is done, however, as we should expect, at the expense of other stores of energy in the universe. Thus, the tide-wheel, or tidal engine, a little-used but most effective source of power, derives its energy entirely from the earth's diurnal rotation. Engines driven by collected rain-water, such as mill-wheels, etc., and others driven by power stored up from winds, etc., depend upon energy radiated from the sun, mainly in the form of heat. None of these can, therefore, in strictness be called the perpetual motion, since the energy of the earth's rotation, or of the sun's heat, is drawn upon in their production.

But the complete proof of the impossibility of procuring the perpetual motion by any arrangement whatever, involving any known forces, was arrived at mainly by the experiments of Joule, who showed that the principle of the conservation of energy extends not alone to the forces for which it was enunciated by Newton, but to every known form of physical action. The date 1840–45 may thus be said to have finally settled this long-disputed question; at all events, until new forms of physical forces may happen to be discovered; and we are now in a position to do generally, what was wisely done by the French academy in 1775 for ordinary mechanical contrivances alone—viz., refuse to consider any scheme whatever which pretends to give work without corresponding and equivalent expenditure. The language in which this decision of the French academy is recorded (*Histoire de l'Académie*, 1775), is well worthy of being quoted, for its calm scientific clearness and brevity, and for its present applicability to physical science in general: "The construction of a perpetual motion is impossible. Even if the effect of the motive-power were not in the long run destroyed by friction and the resistance of the medium [in which the motion takes place], this power could produce merely an effect equivalent to itself. In order, therefore, to produce a perpetual effect from a finite cause that effect must be infinitely small in any finite time. Neglecting friction and resistance, a body to which motion has been given will retain it forever; but only on condition of its not acting on other bodies, and the only perpetual motion possible, on this hypothesis (which, besides, cannot occur in nature), would be useless for the object which the devisers of perpetual motion have in view. This species of research has the inconvenience of being costly; it has ruined many a family; and numerous mechanics, who might have done great service, have wasted on it their means, their time, and their talents.

"These are the principle motives which have led the academy to its decision. In resolving that it will no longer notice such speculations, it simply declares its opinion of the uselessness of the labors of those who are devoted to them."

It has been asserted that the infatuation of the perpetual motionists, who (as may be seen by a glance at the specifications of patents in Britain, France, Belgium, America, etc.), are perhaps more numerous now than ever, is due to two causes—one, the idea that the perpetual motion is a lost, but recoverable invention; the other, that some immense government reward has been for years laid aside for the successful discoverer. But, unhappily, these ideas are as fallacious as the grand delusion itself; and any one

who, in the present state of science, allows himself to be carried away by this fascinating inquiry, loses his time and wastes his talents, more hopelessly than even a "squarer of the circle."

In conclusion, we may mention a few of the cases already hinted at, in which the impossibility of the perpetual motion formed the basis of an investigation. These will show the great use which may be made of even a negative proposition. Helmholtz has shown from it that the ultimate particles of matter must exert upon each other forces, whose direction is that of the line joining each pair of particles, and whose magnitude depends solely on their distance. J. Thomson employed it to show that the freezing-point of water is lowered by pressure, as otherwise work might be created by the freezing of ice-cold water. W. Thomson has employed it to show that a diamagnetic (see DIAMAGNETISM) body does *not* take the opposite magnetism to iron, when in similar circumstances, for if it did, and if, like iron, it took time for the full development of the action, a perpetual motion might be produced.

The literature of this subject is very extensive, but scattered mainly through patent records and ephemeral pamphlets. The *Journal des Savants*, and Montucla's *Histoire des Mathematiques* may be consulted; but especially we would refer the curious to an interesting work by Mr. Dircks (of Patent-Ghost notoriety) entitled *Perpetuum Mobile* (Spon, London, 1861); to which we have been indebted for some of our historical notices. The tenor of the work is such that we cannot easily discover whether the author is a perpetual-motionist or not; but, however this may be, it is extremely complete and interesting as a history.

PERPETUITIES, LAW AGAINST, consists in a rule adopted in England to the effect that property cannot be tied up for a period longer than the lives of some parties already in existence, and 21 years more. Those who have the power of disposing of their property have often attempted to regulate the succession of their estate at distant periods. Such was the object of the original practice of entailing property, and so enforcing the devolution of property on a certain series of heirs to the remotest generations. This power of testators was always looked upon with jealousy, as tending to embarrass future dealings with the property, and frustrate the purposes for which property is established. So early as the reign of Edward IV. a decision was come to by the courts in Taltarum's case, which had the effect of allowing the first tenant in tail in remainder, on arriving at majority, to disentail the estate at discretion. Hence, in England, there has been ever since no mode of settling property in any way so as to tie it up beyond the life of the first who takes an estate of freehold, and the nonage of the tenant in tail next in remainder—i.e., the lives of persons in existence, and 21 years more. This principle applies not only to land, but to personal property. As to the accumulation of the income of property, an attempt was made by the late Mr. Thellusson to create an immense fortune by directing the income of his property to be accumulated during the lives of all his children, grandchildren, and great-grandchildren, who were living at the time of his death, for the benfit of some future descendants, to be living at the death of the survivor. The probable amount of the accumulated fund was expected to be 19 millions. The will was in great measure defeated by the existing law, but in consequence of so conspicuous an attempt, an act of parliament was passed, called the Thellusson act (39 and 40 Geo. III. c. 98), which in future forbids the accumulation of income for any longer time than the life of the grantor or settler, or 21 years from his death. The law in relation to perpetuities in the U. S. is generally the same as in England. It is recognized to be against the policy of the law to allow a person to tie up property for an unreasonably long time. The limitation is fixed by statute in each state, and is ordinarily expressed as being for two lives in being and 21 years afterward. In some instances the period of gestation is added.

PERPIGNAN, a t. of France, and a fortress of the first rank, capital of the department of Pyrénées-Orientales, on the right bank of the river Tet, 5 m. from the Mediterranean, and 35 m. s. by w. of Narbonne. It commands the passage by the eastern Pyrenees from Spain into France, and is defended on the s. by a citadel and by ramparts flanked with bastions, and protected by raised works. Its appearance is exceedingly picturesque. From a distance, its houses are seen in the midst of a forest of orchards; and a closer examination shows a collection of narrow streets, covered with awnings, houses of semi-Moresque construction, with wooden balconies, and courts, and other evidences of Spanish influence. The cathedral, a massive building, begun in the 13th c., the belfry of St. Jacques and the Castiller (now used as a military prison), with its battlement and machicolations, give character to the town. Perpignan is an important scholastic center, and contains a library with 20,000 volumes, a college, numerous schools, museums, and scientific societies. Good *vin ordinaire* (red) is grown in the vicinity; woolen clothes, paper, chocolate, etc., are manufactured, and there is a good trade in wine, wool, cork-bark, and iron ware. Pop. '96, com., 35,088.

Perpignan, as capital of the former county of Roussillon, remained long in the hands of the kings of Aragon, and in 1349 King Pedro founded a university here.

PERQUIM'ANS, a co. in n.e. North Carolina, having Little river on the n. and n.e., Albemarle sound on the s., and Perquimans river dividing it centrally and emptying into the sound; 240 sq. m.; pop. '90, 9293, chiefly of American birth, includ. colored. Its surface is level and swampy, largely covered with a thick growth of pine. The soil is

fertile in the central portion, where it produces corn, cotton, and wheat. Cattle, sheep, and swine are raised. Co. seat, Hertford.

PERRAUD, JEAN JOSEPH, 1821–76; born in a village of the Jura; apprenticed to a wood-carver, afterwards pupil of a school of sculpture in Lyons where he won its highest prize, and in 1842 entered the school *des beaux arts* at Paris. He was then so poor that the government allowed him a gratuity to enable him to go through his studies. In 1847 he produced "Télémacque rapportant à Phalante les ceudres d'Hippias," a low-relief which won the grand prize and enabled him to go to Rome where a life size low-relief group of three figures, entitled "Adieux," attracted great attention, though not cut in marble till 27 years later. He has since achieved the highest rank among French sculptors. "Adam," finished in 1852; "L'Enfance de Bacchus" and "La Faune," in 1857; "St. Geneviéve," 1868; "Désespoir," 1869; "Galatée," 1873; and "Où l'amour va-t-il se nicher?" are a few among a great number, some colossal and others small, of his works.

PERRAULT, CHARLES, a French writer, b. at Paris, Jan. 12, 1628, was the son of an advocate, and received a good education. In 1651 he became a member of the Paris bar, and obtained a considerable measure of success as a pleader; but having made the acquaintance of the minister Colbert, he was ere long diverted from the practice of his profession by receiving the appointment of controller-general of the royal buildings. In 1671 the influence of Colbert procured for him an entrance into the French academy, into which learned body he introduced several important reforms. What first made his name well known was his famous controversy with Boileau regarding the comparative merits of the ancients and moderns, which originated in a poem of Perrault's, entitled *Le Siècle de Louis le Grand,* read before his confrères of the academy, and intended to prove that modern authors were superior to Homer, Herodotus, Plato, Aristotle, Virgil, etc. It was followed up by an elaborate and methodically written *Parallèle des Anciens et des Modernes* (4 vols. 1688–98), which, though an able and learned performance, is a complete failure in its logic. Boileau was his keenest opponent, and fiercely, not to say rudely assailed him in his *Réflexions sur Longin,* to which Perrault replied with equal acrimony, but not with equal wit, in his *Apologie des Femmes* (1694). One good effect of this quarrel was to turn Perrault's attention still more closely and critically to his contemporaries, the result of which was an admirable work, *Hommes Illustres du Siècle de Louis XIV.,* containing 200 critical biographies. But the work that has far more than any other preserved his name is his *Contes des Fées,* or Fairy Tales. See NOVELS. The grace, liveliness, and ingenious child-like fancy displayed in these charming compositions, are beyond all praise, and when we remember that their author was far advanced in years when he wrote them, the feat seems miraculous. "Second childhood" is not always so like the "first," as that of Perrault seems to have been. Perrault died May 16, 1703.

PERRENOT, ANTOINE DE. See GRANVELLE.

PERRON, ANQUETIL DU. See ANQUETIL DUPERRON.

PERRONE, GIOVANNI, 1794–1876; b. Italy; was educated in the university of Turin; went to Rome at the age of 21, and joined the society of the Jesuits. After a year of novitiate he went to Orvieto to teach theology to the Jesuit students. Being ordained priest he was appointed in 1830 rector of the college of Ferrara, and in 1838 taught theology in the Roman college. At the revolution of 1848 he went to England, and returned in 1850. Three years later he was made rector of all the Roman colleges. Regarded as one of the greatest theologians of Italy, he from this time took his seat in the congregation of bishops and regulars, and in the provincial councils, and had the charge of the revision of the books of the eastern church. He was also counselor to the propaganda and the ritual committee. He published more than 60 works, which have been translated into Latin, French, German, English, and Armenian, of which the principal are, *Prælectiones Theologicæ,* 9 vols. (of this there have been 25 editions); *Synopsis Historiæ Theologiæcum Philosophia Comparatæ; De Immaculato B. V. Mariæ Conceptu, au Dogmatico Decreto definiri possit; Analyse et Considerations sur la Symbolique de Moehler; Analyse et Réflexions sur l'Histoire d'Innocent III; Il Protestantismo.*

PERROT, GEORGES, b. France, 1832; educated at the Collège Charlemagne, the normal school, and the French school at Athens. In 1861 he went on an archæological expedition to Asia Minor; in 1863 became a professor in the lyceum Louis-le-Grand, in Paris; in 1877, professor of archæology in the university, and in 1883, director of the higher normal school. Among his publications are *Recollections of a Journey in Asia Minor,* 1864; *The Island of Crete,* 1866; and *Essay on the public and private Law of the Athenians,* 1867.

PERROT D'ABLANCOURT, NICOLAS, 1606–64; b. Chalons-sur-Marne, France; began his career as a lawyer, was entered at the bar, 1624, abandoned law for literature, deserted the Protestant for the Roman Catholic church, and, still unsatisfied, returned after a time to his original faith. He removed from Paris to Holland to read with Saumaise; then he went to England; again to Paris, and in 1637 he became a member of the French academy, and translated the works of Tacitus, which have passed through ten editions. He left Paris and settled on his family estate of Ablancourt. In 1662, at the suggestion of Colbert, he was proposed to Louis XIV. as the historian of his reign, but

his Protestantism stood in the way; he was, however, granted a pension of £120 as his toriographer. Patru wrote his life. His works are distinguished chiefly for elegance of style; the most highly esteemed for this quality is his *Arrian's Wars of Alexander;* other works are translations of *Thucydides, Cæsar, Minutius Felix,* Xenophon's *Anabasis,* four *Orations* of Cicero, the *Strategematica* of Frontinus, the *Apothegms* of the ancients, and an imitation of Lucian.

PERRY, an agreeable beverage made by fermenting the juice of pears. It is extensively made in Worcestershire, Gloucestershire, Herefordshire, and Devonshire, and forms, with cider, the chief diet-drink of those districts. It contains from five to nine per cent of alcohol. The best pears for making perry are those which from their rough taste are least agreeable for eating.

PERRY, a co. in central Alabama, drained by the Cahawba river flowing through it centrally; 774 sq.m.; pop. '90, 29,332, chiefly of American birth, inclu. colored. It is intersected by the Kansas City, Memphis, and Birmingham railroad; and in the s.w. by Washington creek. Its surface is hilly and well timbered. The soil is fertile. Stock-raising is carried on to some extent, and corn, cotton, and tobacco are raised. It contains mineral springs in the northern portion. Co. seat, Marion.

PERRY, a co. in w. central Arkansas, drained by Fourche La Fave and the Arkansas river, which bounds it on the n. and e.; 560 sq. m.; pop. '90, 5538, chiefly of American birth, with colored. The surface is hilly and broken; corn, cotton, and pork are the staples. Coal and marble are found. Co. seat, Perryville.

PERRY, a co. in s. Illinois, intersected by branches of the Illinois Central railroad and by the Wabash, Chester, and Western railroad; 440 sq. m.; pop. '90, 17,529, chiefly of American birth, with colored. It is drained by Beaucoup and Colombo creeks, rising within its limits and emptying into the Mississippi river. The surface is generally level, and a large proportion covered with oak, hickory, and walnut trees. It has an underlying stratum of bituminous coal easily mined. Its soil is moderately fertile. Stock is raised, and the usual products of the western states. Coal mining is the principal industry, and the manufactures include carriages, plows, lumber, flour, saddlery, and harness, agricultural implements, etc. Co. seat, Pinckneyville.

PERRY, a co. in s. Indiana, having the Ohio river for its s. and s.e. boundary, separating it from Kentucky; bounded on the w. by Anderson's creek; 380 sq.m.; pop.' 90, 18,240, chiefly of American birth, with colored. Its surface is hilly, and contains coal mines which appear to be inexhaustible, producing coals, notably those of Cannelton, extensively used in steamboats. Sandstone abounds, and iron. The soil is fertile along the water courses, producing grain and tobacco, and is adapted to stock-raising. Its manufactures are important and constantly increasing, the product of potteries, paper-mills, chair factories, breweries, flour and lumber mills. Co. seat, Cannelton.

PERRY, a co. in s.e. Kentucky, drained by the n. and middle forks of the Kentucky river; about 448 sq.m.; pop. '90, 6331, chiefly of American birth, with colored. The surface is rugged and broken, mostly covered by forests. Corn and grass are the main products. Coal is found. Co. seat, Hazard.

PERRY, a co. in s.e. Mississippi; drained by Leaf river and Black, Bogue Homo, and Tallahala creeks; 1116 sq.m.; pop. '90, 6494, chiefly of American birth, with colored. The surface is almost entirely covered with pine forests. Cotton, corn, cattle and pork, are staples. Co. seat, Augusta.

PERRY, a co. in s.e. Missouri, having the Mississippi river for its e. and n.e. boundary, separating it from Illinois; drained by small creeks; 436 sq.m.; pop. '90, 13,237, chiefly of American birth, with colored. Its surface is rough, large tracts being covered with heavy timber and groves of ash, elm, tulip-tree, etc. The hills contain carboniferous limestone, lead and iron ore, and marble. Its soil is fertile. Co. seat, Perryville.

PERRY, a co. in s.e. Ohio, intersected by the Cincinnati and Muskingum Valley railroad, and by the Ohio Central lines of railroad; 402 sq. m.; pop. '90, 31,151, chiefly of American birth, with colored. It is drained by the head waters of the Hocking river, and a few small creeks. Co. seat, New Lexington.

PERRY, a co. in central Pennsylvania, having the Susquehanna river for its e. and n.e. boundary, a range of the Blue mountains on the s., and the Tuscarora mountains on the w. and n.w.; drained by the Juniata river and Sherman's creek; 550 sq.m.; pop. '90, 26,276, chiefly of American birth, with colored. Its surface is crossed by several mountain ridges well covered with forests of hard wood, and containing limestone and iron ore—the latter extensively mined. It is intersected by the Pennsylvania railroad. The soil of its beautiful valleys is adapted to stock-raising, and produces grain, dairy products, and sweet-potatoes. Its leading industries are the manufacture of leather, flour, metallic wares, boots, woolen goods, etc., and it has wool-carding and cloth-dressing mills. Co. seat, New Bloomfield.

PERRY, a co. in w. central Tennessee; drained by the Buffalo and Tennessee rivers, the latter being the w. boundary; about 420 sq.m.; pop. '90, 7785, chiefly of American birth, with colored. The surface is uneven but fertile; corn, wheat, buckwheat, and peanuts, are the chief products. Limestone is found. Co. seat, Linden.

PERRY, Arthur Latham, b. Lyme, N. H., 1830 ; graduate of Williams College, 1852 professor of history and political economy at the same institution, 1854. He was at one time a correspondent of the *Springfield Republican*, and was minister of a church in Williamstown. In 1865 he published *Elements of Political Economy* in advocacy of free-trade. By the adherents of that system, his writings are regarded as of high authority.

PERRY, Christopher Raymond, 1761–1818; b. R. I.; at the beginning of the revolution he joined the navy, rose to the rank of captain, and served with distinction in several naval engagements. He was captured and for some time confined in the notorious *Jersey* prison-ship. In 1798 he was made a post-captain, and in 1801 was appointed collector of the port of Newport. His five sons, of whom Oliver Hazard and Matthew Calbraith were the most famous, all served with credit as naval officers in the war of 1812.

PERRY, Matthew Calbraith, 1794–1858; b. South Kingston, R. I.; son of Christopher R., and brother of Oliver Hazard; entered the navy 1809; lieut. 1813. In 1819, while cruising in the *Cyane*, he settled the question of the location of the first occupation of Liberia. In 1821–24, in command of the schooner *Shark*, he captured several pirates near the West India islands. In 1833 after a 3-years' cruise in the Mediterranean he became the superintendent of a school for gun practice in the Brooklyn navy-yard and superintended the application of steam to war vessels. In 1837 he was made capt., and in 1838 went abroad to visit the dock-yards, and inspect the danger signals on the coasts. In 1839–41 he was commandant at the Brooklyn navy-yard, afterward of the African squadron and the gulf squadron, and gallantly co-operated with the land forces at the battle of Vera Cruz. In 1852–54 he went on an expedition to Japan. He was one of the first public men in this country who looked for the peaceful opening of Japan, and long before he was appointed to command the fleet, March, 1852, he had carefully studied the land, the people, and the problem from every side. He arrived off Uraga in the bay of Yedo July 7, 1853, and after leaving letters for the Tycoon sailed away July 17, and returned in Feb., 1854. On March 8 the formal articles of convention between the United States and Japan were exchanged, at Yokohama, on the spot now occupied by the Union Christian church. Perry's one mistake was in not treating with the true sovereign, the Mikado, from Ozaka, instead of with his lieutenant, the Tycoon. Commodore Perry was a cultivated scholar, and the *Narrative of the Expedition of an American Squadron to the China Seas and Japan*, though nominally edited by Dr. Francis L. Hawks, is in the main an exact reprint of Perry's diary and autograph narrative. He died in New York. A superb bronze statue of Commodore M. C. Perry, with four bas-reliefs in bronze illustrating scenes in his public life, by J. Q. A. Ward, stands in Truro Park, Newport, R. I., erected by his son-in-law, August Belmont, of New York.

PERRY, Oliver Hazard, 1785–1819 ; b. South Kingston, R. I.; son of Christopher R.; grandson of Judge Freeman Perry ; entered the navy April, 1799, serving soon after in the Tripolitan war, was made master-commander 1812; was in command of a small fleet of gunboats in New York harbor in 1812. In 1813 he served under Chauncey on lake Ontario co-operating in the attack on Fort George ; subsequently was placed in command of a squadron on lake Erie, and with 9 small vessels gained a victory over the British fleet Sept. 10, 1813. These services were publicly acknowledged by congress and the Pennsylvania senate, and he was promoted to capt., his commission dating from the day of the victory. He was present at the re-taking of Detroit, co-operating with Gen Harrison, and at the battle of the Thames, Oct. 5, 1813. In 1815 he was on the Mediterranean in Decatur's squadron in command of the *Java*. In 1819 he went to the West Indies in the *John Adams*, and died of the yellow fever. In 1860 a marble statue was erected to his memory at Cleveland, Ohio.

PERRY, William Stevens, d.d., ll.d., b. Providence, R. I., 1832, graduated at Harvard Coll., 1854 ; ordained priest in the Prot. Epis. church, 1858 ; held several rectorships in New England, and was pres. of Hobart coll., 1876. He was consecrated bp. of Iowa, 1876. Bp. Perry is the author of many works ; among these are : *The Connection of the Church of England with Early American Colonization*, *Questions on the Life and Labors of the Great Apostle*, and many historical collections of the American colonial church. In 1885 he published his great work on the history of the Epis. church.

PERSEA. See Avocado Pear.

PERSECUTIONS, THE TEN, of the Christian church, is the name by which are known in ecclesiastical history certain periods of special severity exercised towards the rising community of Christians, for the purpose of compelling them to renounce their new creed, and to conform to the established religion of the empire. The Christian community were at all times regarded with suspicion and dislike in the Roman empire—the constitution of Rome not only being essentially intolerant of those new religions which, like the Christian, were directly aggressive against the established religion of the state, but being particularly hostile to private associations and private assemblages for worship, such as those which every Christian congregation by its very nature presented; and thus there are very few periods, during the first three centuries, in which it can be said that the church enjoyed everywhere a complete immunity from persecution. But the name

is given particularly to certain periods when either new enactments were passed against Christianity, or the existing ones were enforced with unusual rigor. The notion of *ten* such periods is commonly accepted almost as an historical axiom; and it is not generally known that this precise determination of the number is comparatively recent. In the 4th c., no settled theory of the number of persecutions seems to have been adopted. Lactantius reckons up but six; Eusebius does not state what the number was, but his narrative supplies data for nine. Sulpicius Severus, in the 5th c., is the first who expressly states the number at *ten;* but he only enumerates nine in detail, and in completing the number to ten, he adds the general persecutiou which, at the coming of Antichrist, is to precede the end of the world. The fixing of ten as the number seems to have orignated in a mystic allusion to the ten horns of the beast in the apocalypse (xvii. 12).

It need hardly be said, however, that this is only a question of words, the diversity of enumeration arising from the different notions attached by the several historians to the designation *general.* If taken quite strictly to comprise the entire Roman empire, the number must fall below ten; if used more loosely of local persecutions, the number might be very largely increased. The ten persecutions commonly regarded as general are the following: the persecution under Nero, 64 A.D.; under Domitian, 95 A.D.; under Trajan, 107 A.D.; under Hadrian, 125 A.D.; under Marcus Aurelius, 165, A.D.; under Septimius Severus, 202 A.D.; under Maximinus, 235, A,D.; under Decius, 249 A.D.; under Valerianus, 257 A.D.; under Diocletian, 303 A.D. The extent and the duration of some of these have been the subject of considerable controversy, and indeed an animated discussion was maintained for a long period as to the probable total number of victims in the pagan persecutions of the church. Such controversies are beyond the scope of this publication. It is quite certain that there have been exaggerations on the Christian as well as on the adverse side; but it has been shown beyond the possibility of doubt, and the most recent explorations have confirmed the arguments, that the data on which the estimates of Dodwell and Gibbon, the most prominent advocates of the theory of the small number, were founded, were uncertain, and even fallacious; and that, not to speak of the many victims of the constantly recurring local violences, the number who fell in each of the above-named persecutions was both large in itself, and spread, in most cases, over a considerable extent of the Roman empire. The most violent, as well as the most widely-spread of these persecutions, were those under Nero, Trajan, Maximinius, Decius, and Diocletian. The last-named, though called by Diocletian's name, was in reality far less the work of that emperor than of his colleague Galerius; but it was extremely cruel, and, with occasional interruptions, continued from the year 303 down to the victory of Constantine over Maxentius—a period of nearly ten years.

PERSEPH'ONE. See PROSERPINA.

PERSEP'OLIS (Persian City), the Greek translation of the lost name of the capital of ancient Persia (*Parsa-Karta?*), was situated on the river Araxes (Bendemir), to the e. of the river Medus (Polwat, or river of Murghab), in the plain of Merdusht, about 35 m. to the n.e. of Shiraz, on the road to Ispahan. A certain number of most remarkable ruins is all that now remains of that city, with which, according to ancient writers, "no other city could be compared either in beauty or in wealth," and which was generally designated "the glory of the east." Darius Hystaspes, Xerxes, Artaxerxes, and other Achæmenides, each in his turn contributed towards its aggrandizement. Alexander the great, in his march of conquest, is said to have destroyed Persepolis completely; but this must probably only be understood to apply to some of the chief palaces. It may also be presumed that after the fall of the Achæmenides, that extension of the original town (afterwards known, and important in history up to within a recent period, as Istakhar), on which were situated the royal edifices and temples used as the royal treasuries up to the time of Epiphanes, gradually fell into decay. The situation of these structures, overlooking the vast luxuriant plain of Merdusht, is described in terms of rapturous enthusiasm by every traveler from Chardin to our own day. Three groups are chiefly distinguishable in the vast ruins existing on the spot. First, the Chehel Minâr (Forty Pillars), with the Mountain of the Tombs (Rachmed), also called Takht-i-Jamshîd or the structure of Jamshîd, after some fabulous ancient king, popularly supposed to be the founder of Persepolis. The next in order is Naksh-i-Rustam, to the n.w., with its tombs; and the last, the building called the Haram of Jamshîd. The most important is the first group, situated on a vast terrace of cyclopean masonry at the foot of a lofty mountain-range. The extent of this terrace is about 1500 ft. n. by s., and about 800 e. by w., and it was, according to Diodorus Siculus, once surrounded by a triple wall of 16, 32, and 60 cubits respectively in height, for the triple purpose of giving strength, inspiring awe, and defense. The whole internal area is further divided into three terraces—the lowest towards the s.; the central being 800 ft. square, and rising 45 ft. above the plain, and the third, the northern, about 550 ft. long, and 35 ft. high. No traces of structures are to be found on the lowest platform; on the northern, only the so-called "Propylæa" of Xerxes; but the central platform seems to have been occupied by the foremost structures, which again, however, do not all appear to have stood on the same level. There are distinguished here the so-called "great hall of Xerxes," called Chehel Minâr, by way of eminence), the palace of Xerxes, and the palace of Darius,

towering one above the other in successive elevation from the ground. The stone used for the buildings is dark-gray marble, cut into gigantic square blocks, and in many cases exquisitely polished. The ascent from the plain to the great northern platform is formed by two double flights, the steps of which are nearly 22 ft. wide, 3½ in. high, and 15 in. in the tread, so that several travelers have been able to ascend them on horseback. What are called the propylæa of Xerxes on this platform are two masses of stone-work, which probably formed an entrance-gateway for foot-passengers, paved with gigantic slabs of polished marble. Portals, still standing, bear figures of animals 15 ft. high, closely resembling the Assyrian bulls of Nineveh. The building itself, conjectured to have been a hall 82 ft. square, is, according to the cuneiform inscription, as interpreted by Rawlinson, the work of Xerxes; the inscription reads as follows:

"The great god Auramajda, he it is who has given this world, and who has given life to mankind, who has made Xerxes king, both king and law-giver of the people. I am Xerxes the king, the great king, the king of kings, the king of the many-peopled countries, the supporter also of the great world, the son of king Darius, the Achæmenian.

"Says Xerxes the king, by the grace of Auramajda, I have made this gate of entrance; there is many another nobler work besides this Persepolis which I have executed, and which my father has executed;" etc.

An expanse of 162 ft. divides this platform from the central one, which still bears many of those columns of the hall of Xerxes from which the ruins have taken their name. The staircase leading up to the Chehel Minâr, or Forty Pillars, is, if possible, still more magnificent than the first; and the walls are more superbly decorated with sculptures, representing colossal warriors with spears, gigantic bulls, combats with wild beasts, processions, and the like; while broken capitals, shafts, pillars, and countless fragments of buildings, with cuneiform inscriptions, cover the whole vast space of this platform, 350 ft. from n. to s., and 380 from e. to west. The great hall of Xerxes is computed to have been a rectangle of about 300 to 350 ft., and to have consequently covered 105,000 sq. ft., or 2½ acres. The pillars were arranged in four divisions, consisting of a center group six deep every way, and an advanced body of twelve in two ranks, the same number flanking the center. Fifteen columns are all that now remain of the number. Their form is very beautiful. Their height is 60 ft., the circumference of the shaft, 16, the length from the capital to the torus, 44 feet. The shaft is finely fluted in 52 divisions; at its lower extremity begin a cincture and a torus, the first, 2 in. in depth, and the latter, 1 ft., from whence devolves the pedestal, shaped like the cup and leaves of the pendent lotus, the capitals having been surmounted by the double semi-bull. Behind the hall of Xerxes was the so-called hall of hundred columns, to the s. of which are indications of another structure, which Fergusson terms the central edifice. Next along the w. front stood the palace of Darius, and to the s. the palace of Xerxes, measuring about 86 ft. square, similarly decorated. The chief ruin exists at Haji Abad on the river Polvar, a few miles above P. See travels of Niebuhr, Ker Porter, Rich, etc.; Fergusson's *Palaces of Nineveh and Persepolis Restored;* Vaux's *Nineveh and Persepolis*, and Rawlinson's *Five Great Monarchies*. See also CYRUS, DARIUS, XERXES, CUNEIFORM, and PERSIAN ARCHITECTURE. See illus., PERSIA, p. 536; ARCHITECTURE, Vol. I.

PERSON, a co. in n. North Carolina, having the state line of Virginia for its n. boundary; drained by head waters of Dan river, and the Hycootee and Flat rivers; 420 sq.m.; pop. '90, 15,151, chiefly of American birth, inclu. colored. Its surface is diversified by hill, valley, and plain, well covered with forests of pine, oak, and hickory, and containing copper ores, graphite, and slate. Its soil produces grain, sweet-potatoes, tobacco, and dairy products. Live stock is raised. Co. seat, Roxboro.

PERSEUS, also PERSES, the last king of Macedonia, was the eldest son of Philip V., and was b. in the latter part of the 3d c. B.C. He was trained to a military life from his earliest years, and after bringing about the death of his younger brother Demetrius, who was a favorite both with the Macedonians and the Romans, he succeeded his father on the throne 179 B.C. Philip had long foreseen that a contest between Rome and Macedon was inevitable, and he had carefully prepared for it, so that Perseus, on his accession, found himself forearmed. Meanwhile he governed Macedon with great prudence and moderation, and became decidedly popular with his subjects and neighbors. Seleucus IV. (Philopator) gave him his daughter Laodice in marriage; Prusias, the Bithynian king, married his sister; the Greek states looked favorably on his projects, and his envoys were well received even at Carthage. The Romans took the alarm, and—after some delusive negotiations—sent an army into Thessaly (171 B.C.). The war lasted four years; in the first three the advantages were so little on the side of the Romans that there was a wide-spread feeling in Perseus's favor in the countries bordering on the Levant and the Archipelago. In the beginning of the fourth campaign (168 B.C.), L. Æmilius Paulus arrived, and took command of the Roman forces. A great battle was fought at Pydna (June 22), in which the army of Perseus was utterly routed. The king himself was soon afterwards forced to surrender, and conveyed to Rome, where he adorned the triumph of the conqueror. He died in captivity at Alba, a few years later.

PERSEUS, in Grecian mythology, the son of Zeus and Danaë (q.v.), and grandson of Acrisius. He was brought up at Seriphos, one of the Cyclades, where Polydectes

reigned, who, wishing to get rid of him for private reasons, sent him when yet a youth to bring the head of the Gorgon Medusa, on the pretense that he wanted to present it as a bridal gift to Hippodamia. Perseus set forth under the protection of Athene and Hermes, the former of whom gave him a mirror, by which he could see the monster without looking at her (for that would have changed him into stone); the latter, a sickle, while the nymphs provided him with winged sandals, and a helmet of Hades, or invisible cap. After numerous wonderful adventures, he reached the abode of Medusa, who dwelt near Tartessus, on the coast of the ocean, and succeeded in cutting off her head, which he put into a bag, and carried off. On his return, he visited Ethiopia, where he liberated and married Andromeda, by whom he subsequently had a numerous family, and arrived at Seriphos in time to rescue his mother from the annoyance of the too ardent addresses of Polydectes, whom, along with some of his companions, he changed into stone. After this he went to Argos, from which Acrisius fled to Thessaly, and Perseus assumed the vacant throne. But this, like many other details of the myth, is differently narrated. Perseus was worshiped as a hero in various parts of Greece, and, according to Herodotus, in Egypt too. In ancient works of art, the figure of Perseus much resembles that of Hermes.

PERSEVERANCE OF SAINTS, a doctrine necessarily resulting from the most essential parts of the Calvinistic system, and therefore held by almost all who adopt the Calvinistic or Augustinian doctrines. It is advocated not only by arguments from other doctrines, as those of election, atonement, the intercession and mediatorial dominion of Christ, imputed righteousness and regeneration, but also from many texts of Scripture, as those which declare *eternal life* to be always connected with believing, and those which encourage the believer to depend on the faithfulness, love, and omnipotence of God. To an objection very commonly urged against it, that it tends to make men careless concerning virtue and holiness, its advocates reply that this objection is only valid against a doctrine very different from theirs, the true doctrine of perseverance of saints being one of perseverance in holiness, and giving no encouragement to a confidence of final salvation which is not connected with a present and even an increasing holiness.

PERSHORE, a market t. in the co. of Worcester, and 9 m. s.e. of the city of that name, on the Avon. It contains two churches—that of St. Andrew's, small and ancient; and the church of the holy cross, in Norman and early English, with a lofty square tower. This church is the only remaining portion of the ancient abbey-church of the same name. Pop. '91, 2,631, who are employed in the engineering and machine works and in the stocking manufactories, and in raising fruits and vegetables for the markets of the large manufacturing towns in the vicinity.

PERSIA, called by the natives IRAN (see ARYAN RACE), the most extensive and powerful native kingdom of western Asia, is bounded on the n. by the great plain of Khiva, the Caspian sea, and the trans-Caucasian provinces of Russia: on the e. by Bokhara, Afghanistan, and Beloochistan; on the s. by the strait of Ormuz and the Persian gulf, and on the w. by Asiatic Turkey. It extends 900 m. from e. to w., and 700 m. from n. to s., and has an area of about 628,000 miles. It consists for the most part of a great table-land or elevated plateau, which in the center and on the east side is almost a dead level; but on the n., w., and s. is covered with mountain-chains. The province of Azerbijan, in the n.w., is almost wholly mountainous. From its southern boundary, the majestic range of the Elburz runs eastward, following the line of the Caspian coast at a distance varying from 12 to 60 miles. On reaching Astrabad, the mountains sink into ridges of lower elevation, one of which joins the Paropamisus in Afghanistan. A hill country lies n. of this line; it terminates in the Daman-i-koh chain, which sinks abruptly to the low plain of Turkistan. South and e. of Azerbijan, a broad mountain-belt traverses Persia from n.w. to s.e., the chains and valleys of which it consists lying in the same direction. To this region belong the mountains running from Hamadan to Shiraz, many of the peaks of which are clad with perpetual snow; and the Zagros mountains and Pushti Kuh on the western frontier. The Persian mountains are mostly primitive; granite, porphyry, feldspar, and mountain-limestone enter largely into their composition. They also exhibit indications of volcanic action—Taftan, south of lake Zirreh, or Zamoon, being an active, and Demavend an extinct volcano; and the destructive earthquakes which are still of frequent occurrence in the n. and n.w. of Persia, indicate the presence of subterranean fires. The Persian plateau, which lies in an angle formed between these mountains, and spreads eastward to the plateau of Afghanistan, ranges from 2,000 to 5,000 ft. above sea level, the lowest portion being the great salt desert in the s.w. of Khorassan, which has 2,000 ft. of elevation above the sea; while the average elevation of the whole plateau above the sea is about 3,700 feet.

Almost the whole of Khorassan (q.v.), the n. half of Kerman (q.v.), the e. of Irak-Ajemi (q.v.), which form the great central plain, and detached portions of all the other provinces, with the exception of those on the Caspian sea, forming more than three-fourths of the surface of Persia, are desert. In some parts of this waste the surface is dry, and produces a scanty herbage of saline plants; in other parts, it is covered with salt marshes, or with a dry, hard, salt crust, sometimes of considerable thickness, which glitters and flashes in the sunlight, forcing the traveler on these inhospitable wastes to wear a shade to protect his eyes; but by far the greater portion of this region consists of

52
56
60
64
68
72
40
36
RUSSIAN EMPIRE
TURKESTAN
ARAL SEA
CASPIAN SEA
TRANS CASPIAN PLATEAU
Line of Wells dug by the Russians
Kara Bugaz
Black Gulf
Strait of Kara B.
Krasnovodsk
Mikhailovsk
Adji Bojur B.
DESERT OF KHIVA OR KARAKUM
SANDY DESERT OF KIZIL KUM
BATKAK KUM SANDY DESERT
AMU DARIA
KHIVA (Kharesm)
BOKHARA
Samarcand
Tashkend
KOKAND
Sir Daria
(Juxartes)
Merve
New Castle of Merve
Tejend Swamp
Kizil Arvat
Askabad
MESHED
Sarakhs
Old Sarakhs
HERAT
CABUL
Jihoon R. (Oxus)
Amu Daria
KOH-I-BABA
Chardjuy
Balkh
Andkhoi
Khulm
Kunduz
BADAKSHAN
FERGHANA
KARATEGHIN
CHINESE EMPIRE
ALEXANDRIAN MTS.
Salt Lake
Khojend
Jizak
Uchum
MAZANDERAN
ASTRABAD
GREAT SALT DESERT
KHORASAN
PERSIA
Nishapoor
Khyber Pass
SUFEID KOH

CENTRAL ASIA
SCALE OF MILES
0 50 100 200
Railroads thus
AFGHANISTAN
BALUCHISTAN
PERSIAN GULF
ARABIAN SEA
TROPIC OF CANCER
Longitude East from Greenwich
56 60 64 68 72
24 28 32

sand, sometimes so light and impalpable as to be shifted hither and thither by the slightest breeze. This great central desert contains a few oases, but none of great extent. A narrow strip of low and level country extends along the shores of the Persian gulf and the strait of Ormuz. It consists of a succession of sandy plains, occasionally interrupted by a plantation of palms near the scanty rivulets which traverse it. It is called Dushtistan, or Gurmsir—that is, the warm region, in opposition to the mountainous districts, called Sirhud, or the cold country.

Although so much of Persia is desert, some parts of the country are of exceeding fertility and beauty; the immense valleys, some of them 100 m. in length, between the various ranges of the Kerman mountains, abound with the rarest and most valuable vegetable productions. Great portions of the provinces of Fars, Khuzistan, Ardelan, and Azerbijan have been lavishly endowed by nature with the most luxuriant vegetation; while the provinces of Ghilan and Mazanderan, which lie between the Elburz and the Caspian sea, and the southern slopes of the Elburz, are as beautiful as wood, water, and a hot climate can make them—the mountain-sides being clothed with trees and shrubs, and the plain, 300 m. long by from 5 to 30 m. wide, studded with mulberry plantations, rice fields, vineyards, orchards, orange grounds, and sugar and cotton plantations.

Rivers.—Persia has hardly one river that can properly be termed navigable, though some of them are several hundred miles in length, and of great width and volume of water; among those of sufficient importance to deserve mention is the Karun, which rises in the mountains to the s. of Ispahan, and falls into the Shat-el-Arab near Mohammerah. The rivers which flow to the southward receive, in the latter part of their course, few tributaries, and fertilize only a narrow strip of land on each side of them, except when their waters are applied, by means of canals or other works, to the artificial irrigation of the soil. This mode of increasing and extending the productive powers of the country was much employed in ancient times; but the constant change of masters, and the never-ending disturbances under which Persia has so long suffered, led to the neglect of the practice, and most of these monuments of the architectural skill and laborious industry of the ancient Persians are now ruinous.

Lakes.—Persia, as a natural consequence of the nature and situation of its surface, abounds with saline lakes, and there are nearly thirty of them having no visible outlets. The chief lake is lake Urumeyah (q.v.), in Azerbijan. Lake Bakhtegan, in the e. of Fars, the receptacle for the drainage of the northern half of that province, is about 60 English m. in length by 9 in breadth. Lake Shiraz is much smaller. Part of lake Zirreh is now included in the frontier of Persia, but it may still be considered as chiefly belonging to Afghanistan.

Climate and Products.—The climate is necessarily very varied. What the younger Cyrus is reported to have said to Xenophon regarding the climate, "that people perish with cold at the one extremity, while they are suffocated with heat at the other," is literally true. Persia may be considered to possess three climates—that of the southern Dushtistan, of the elevated plateau, and of the Caspian provinces. In the Dushtistan, the autumnal heats are excessive, those of summer more tolerable, while in winter and spring the climate is delightful. On the plateau, the climate of Fars is temperate. About Ispahan, the winters and summers are equally mild, and the regularity of the seasons appears remarkable to a stranger. To the n. and n.w. of this, the winters are severe. The desert region of the center and e., and the country on its border, endure most oppressive heat during the summer, and piercing cold in winter. The Caspian provinces, from their general depression below the sea level, are exposed to a degree of heat in summer almost equal to that of the West Indies, and their winters are mild. Rains, however, are frequent and heavy, and many tracts of low country are marshy and extremely unhealthy. Except in the Caspian provinces, the atmosphere of Persia is remarkable above that of all other countries for its dryness and purity.

The cultivated portions of Persia, when supplied with moisture, are very fertile, producing an immense variety of crops. The chief cultivated products are wheat, barley, and other cereals, fruit, gums, cotton, wool, woods, fish, licorice, rice and tobacco. The vine flourishes in several provinces, and the wines of Shiraz are celebrated in eastern poetry. Mulberries are also largely cultivated, and silk is one of the most important products of the kingdom. The forests of the Elburz abound with wild animals, as wolves, tigers, jackals, boars, buffaloes, foxes, and the Caspian cat. Lions and leopards also abound in Mazanderan. Among domestic animals, the horse and camel hold the first place. The horses have always been celebrated as the finest in the east. They are larger and more handsome, but less fleet than the Arabian horses. The Caspian rivers abound with fish, especially sturgeon, great quantities of which are cured and exported to Russia.

Inhabitants.—The settled population are chiefly Tajiks, the descendants of the ancient Persian race, with an intermixture of foreign blood. To this class belong the agriculturists, merchants, artisans, etc. The Tajiks are Mohammedans of the Shiite sect, with the exception of the remaining Parsees or Guebers (q. v.), who are found in Kerman and Fars, and still retain their purity of race and religious faith. The Tajiks have been spoken of as timid, cunning, and servile, but in the cities of Turkistan recently conquered by Russia, they make excellent subjects, ready and apt to adopt and appreciate the knowledge and habits of Europe. In the work quoted below, Vambéry speaks of their industry, and their capacity for and love of culture. He says, that which the Japanese are in the e. the Tajiks may become in the w. of Asia; and it is a settled matter that they will form the medium for the introduction of the civilization of the

west into the interior of Asia. The nomad or pastoral tribes, or eylats (*eyl*, a clan), often spelt *illyats*, are of four distinct races—Turkomans, Kurds, Lûurs, and Arabs. Their organization is very similar to that which formerly subsisted among the Highland clans of Scotland, with the exception that the former are nomad, while the latter inhabited a fixed locality. Each tribe is ruled by its hereditary chief (*ujak*), and under him by the heads of the cadet branches (*tirehs*) of his family. Of the four nomad races, the Turkoman is the most numerous, and forms at the present day the ruling race in Persia. The Kurds are few in number, the greater part of their country and race being under the sway of Turkey. The Arabs are also few in number, and at the present day can hardly be distinguished from the Persians, having adopted both their manners and language. The Lûurs are of nearly pure Persian blood. The nomad races, especially the Turkomans, profess the Sunni creed; they are distinguished from Tajiks by their courage, manliness, and independence of character; but they are inveterate robbers, and since their entrance into the country in the 10th c., it has been continually distracted by civil wars and revolutions. Most of the Mohammedans belong to the Shiite sect and the priesthood is very powerful, its influence being usually exerted against progress of any kind. It is easy to become a priest, the only requirement being a knowledge of the Koran and an ability to interpret its laws. If the priest or mollah prove himself a man of wisdom whose interpretations of the divine law are regarded as just and whose knowledge of the faith and of traditions is extensive, he becomes a *Mujtahid* or chief priest. The Mujtahid of Kerbela in Bagdad is the chief authority in religious matters, and is held by some to be the viceregent of the Prophet. The government does not appoint the chief priest but chooses the chief judge or *Sheikh-el-Islam*, as well as the chiefs of the principal mosques in the cities. The estimates of 1894 placed 8,000,000 of the population as Shiites, 800,000 as Sunnites, and of the non-Mohammedan population, 9,000 Parsees, 45,000 Armenians, 25,000 Jews, and 25,000 Nestorians.

We have no certain information regarding the population of Persia. There can be no doubt that in antiquity, and even during the middle ages, while the irrigation works still fertilized great tracts of country, it supported a great population. A native estimate, referred to by sir John Malcolm, fixed the modern population at 200,000,000. In the 17th c., the French traveler, Chardin, thought 40,000,000 not too high a figure. Later travelers, however, reduced these sums to numbers varying from 15,000,000 to 8,000,000. Much surprise was accordingly expressed when Mr. R. Thomson, who had traveled in every province of Persia, and collected statistical information, made careful calculation from the taxes collected, etc., and reported that the entire population did not exceed 5,000,000, and was probably not over 4,000,000. His estimate was long generally accepted as the most trustworthy, but estimates in 1894 placed the total population at 9,000,000. In 1894 the principal cities with their populations were given as follows:—Teheran, 210,000; Tabriz, 180,000; Ispahan, 80,000; Meshed, 60,000; Barfurush, 50,000; Kerman and Yezd between 40,000 and 45,000; Hamadan, Shiraz, Kazvin, Kom, Kashan, and Resht, between 25,000 and 30,000. The nomad population consisted of about 720,000 Turks; 675,000 Kurds and Leks; 260,000 Arabs; 234,000 Lûurs and 20,700 Baluchis and Gypsies.

The insecurity of property has prevented the improvement of land, the extension of trade, and public works of every kind. The roads are utterly neglected. The houses, those of the wealthiest people not excepted, appear contemptible, being generally built of earth or mud, and are grouped, even in the towns, with little attention to uniformity or order. They scarcely ever exceed one story in height, and they are surrounded by high blank walls. The public buildings, such as mosques, colleges, and caravansaries, are of similar appearance to the ordinary houses, and built of the same materials. The interiors, however, of the houses of the rich are sometimes perfect paradises of luxury and elegance; and however much dwellings constructed of mud may offend a European eye, it is questionable whether, with all its disadvantages, mud is not a better building material than wood or stone in a country possessing such a climate as Persia. The miserable look of the towns is, however, greatly improved by the beauty of the gardens which surround them.

Manufactures and Trade.—The trade of Persia is by no means commensurate with its size and wealth. It has long been hampered by the indifference of the richer classes to commercial and industrial matters. The Shah Muzafer-ed-Din, who succeeded his father in the spring of 1896, showed more of a disposition to encourage trade and industry than his predecessors, but work in this line is hindered by the prejudices of the population. The beauty, as well as the durability, of Persian wares has been celebrated for centuries, although a comparatively small portion of the wealth of the country is turned into industrial capital, and enterprise has been further hindered by the lack of mutual confidence among the people. A large, and of course influential, class have always regarded trade of any sort as degrading. The industrial classes, therefore, had only their own resources to rely upon and have been aided by no national policy for the promotion of home industries. The manufactures of P. have hardly emerged from the domestic stage of industry and some of their finest rugs and carpets are still designed and woven in the tents of the semi-barbarous Kurds and Turkomans, who obtain the wool from their flocks and the dyes from the plants and herbs on their native hills. Cotton is one of the chief articles of export, Russia receiving nearly all of it. A consular report in 1896 estimated the quantity annually exported at about 4,000 tons. The manufacture of raw silk was formerly a very important industry, but between 1875 and 1895 there was a marked decline, and at the end of that period only a small proportion

of the former output was produced. The attempt made toward the end of this period to improve the silk culture by the introduction of new seeds led to a partial and temporary revival. The P. tobacco is well known throughout the world. The best quality is grown in the neighborhood of Shiraz in the province of Fars, but of this little is exported. A large part of the tobacco crop goes to Turkey and Egypt, and the home consumption is large. Opium is another important article of export and the trade in this has increased in consequence of the opposition to its production in India. China now receives a large supply of opium from Persia, and the home consumption has attained considerable dimensions. A well-known export of Persia is asafetida, which is the product of a plant found chiefly in the provinces of Kurman and Yezd. It grows wild, but its preparation requires great care. It is chiefly exported to India, where it is used by the Hindoos as a flavor for food. Some is consumed in P., but it is not used much for medicinal purposes. The preparation of attar of roses, for which P. has long been famous, is still carried on, but to no such great extent as formerly. The export of wool has considerably increased, especially of the coarser quality; the finer and more silky wools are employed at home in the manufacture of rugs and carpets. Persian wheat is of an especially fine quality and the export trade in it is large, the greater part going to England and India. The Caspian sea supplies a large number of sturgeon, from the roe of which caviare, an important article of trade, is obtained. The fisheries are run by Russian Armenians, from whom the Persian government derives a considerable rent. The wines of Shiraz are celebrated in Eastern poetry, but of the best quality a comparatively small quantity is now produced. In flavor it is not unlike sherry. Owing to the absorption of too much water in consequence of the irrigation of the Persian vineyards, the grape yields a wine which deteriorates with age, turning sour or insipid. Carpets and rugs are exported to all parts of the world, being highly valued for the durability of their colors, the artistic character of their designs, and their exquisite workmanship. There is a considerable export trade also in shawls, which are cheaper, and in general not of such fine quality as the Cashmere shawls. The trade in them is for the most part limited to Arabia and Constantinople. Astrakhan is a considerable article of trade. It is made from the skins of very young black lambs, and the best quality produced is from flocks in the neighborhood of Shiraz, but the industry led to so serious a diminution of the flocks, that the Persian government prohibited the exportation of the skins. Much, however, is exported in spite of the law. In the province of Khorassan are famous turquoise mines, the products of which are exported to the countries of the east as well as to most civilized countries, the Persian stones being regarded as superior to those obtained in any other part of the world. The pearl fisheries are also of great value and their rent yields a considerable revenue to the government. They are found in the Persian gulf, and the best pearls, unless they are taken for the Shah's collection, are exported chiefly to London and Paris. As to the imports, P. derives her petroleum supply from Russia; sugar from Russia and France; cloth from Austria, Russia, Belgium, and England; glass, china, and earthenware from Austria; iron from Russia; copper from England; tea from India and China; and coffee from Mocha, India, and Ceylon. Other important articles of import may be classed under the heads of fancy articles, builders' hardware, clocks, watches, etc., leather goods, carriages and harness, tobacco, druggists' wares, musical instruments, canned goods, liquors, dress goods, and firearms.

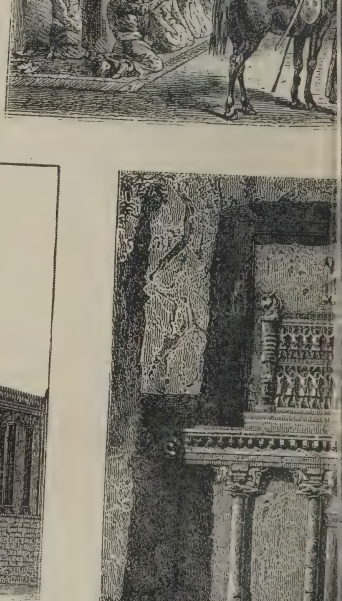
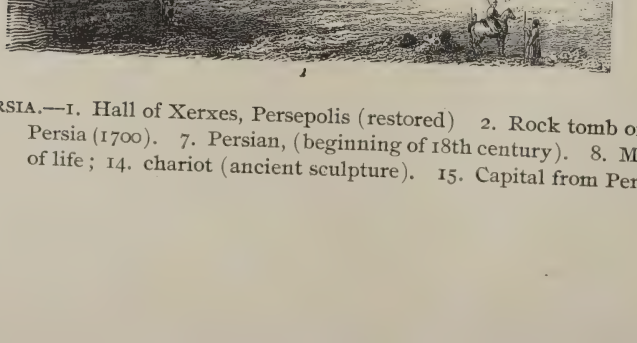
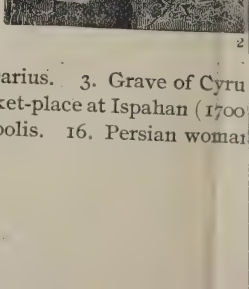
Government, Taxation, Education, etc.—The government of Persia is a pure despotism, limited only by domestic intrigues, dread of private vengeance, and an occasional insurrection. The last-named is the principal check against unjust government on the part of the monarch, while the former two operate as powerful restraints on his ministers. The monarch, who has the title of "Shah" or Shahinshah (king of kings), possesses absolute authority over the lives and property of his subjects. His deputies, the governors of provinces and districts, possess similar authority over those under them; their actions are, however, liable to revision by the Shah, who may summarily inflict any punishment upon them for real or alleged misgovernment. Oppression of the working and mercantile classes is almost a necessity of such a form of government. The office of *Shadr Azam*, abolished for a time was reinstituted in 1893. There is a ministry, nominally modeled after the cabinets of European states, consisting of the ministers of foreign affairs, of war, of finance, and of the interior. These are the chief ministers, but other departments represented are commerce, treasury and customs, justice, instruction, mines, telegraphs, ports, the press, and religious endowments. The law, which in civil cases is administered by Mollahs (q. v.), in criminal cases by a state court, is founded on the Koran and on tradition. The punishments commonly inflicted are fines, flogging (the bastinado), and death, either by decapitation, stabbing, or torture. The beglerbegs, or governors of provinces, who are always chosen from the governing race, the Turkomans, and are generally of the blood-royal, oppress to the utmost the poor Tajiks. They are seldom able, however, to protect their provinces from the ravages of the predatory eylat hordes, who, though nominally subject to the Shah, are governed by their own khans, and are really independent. The revenue consists principally of money raised by taxes upon towns, villages, and districts, each being required to pay a fixed sum. It is estimated that 82% of the revenue is obtained in this manner, which imposes the heaviest burden on the laboring classes. Of the other sources of revenue the most important is the customs which yield nearly 15%. The balance is obtained from mines, posts and concessions of the government.

Elementary education is very generally diffused among all classes, but consists chiefly of the reading of the Koran. There are, however, numerous colleges which are supported by the state, and in these instruction is given in religion, Persian and Arabic

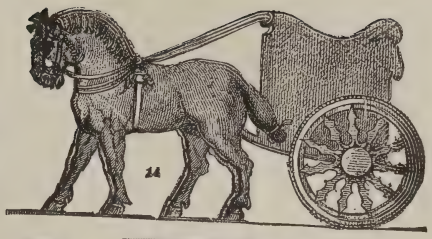
literature and to some extent in science. The polytechnic school of Teheran, opened in 1849, has attempted with some success to introduce a knowledge of Western literature and science. In the same city, as well as at Tabriz, there are military colleges. For an account of the Persian army, see the article ARMIES, MODERN.

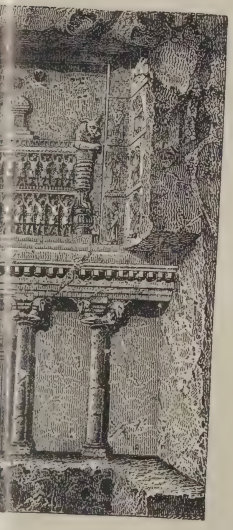
Political Divisions, etc.—From the earliest times down to the present century, Persia was divided into seven or eight great divisions; but about the time when it was attempted to introduce European civilization into the country, and discipline into the army, the country was anew divided into 25 provinces. At present Persia is divided into 22 large and 10 small provinces, each under a governor-general who is responsible to the Shah. There are many interesting ruins of ancient and celebrated cities in Persia—for example, Persepolis (q. v.), Rhages, or Rhé, Shahpur, Istakhar, Tûs, Merv, Shushan, Hamadan, etc. See BEHISTUN.

History.—According to the *Shah Nameh* of Firdusi (q.v.), the history of Persia begins some thousands of years before the Christian era. Little has yet been done towards extracting the grains of historical truth that may be contained in the mass of fable that constitutes the native Persian annals; although hopes are cherished that by aid of the many inscriptions and monuments that are being daily discovered, light may yet be thrown upon many points. In the meantime, we must rest contented with the accounts derived from Greek writers. The north-western part of Iran, anciently called Media (q.v.), was, at the earliest period known to the Greeks, a part of the Assyrian empire, but the Medes revolted, and (708 B.C.), under Dejoces, established an empire which subdued both that of Assyria and their own kindred tribes of Persis. See MEDIA. About 537 B.C., the Persians under Cyrus (q.v.)—the Kai-Khusru of the Persians—(559–529 B.C.) rebelled, subdued their former masters, the Medes (who from this time became amalgamated with them), and established a mighty empire, which included besides Persia, as far as the Oxus and Indus, Asia Minor, Syria, Palestine, and Mesopotamia. His son, CAMBYSES, a most ferocious and blood-thirsty tyrant (529–522 B.C.), subdued Tyre, Cyprus, and Egypt. After the brief rule of the usurper SMERDIS (522–521 B.C.), Darius I. (q.v.), surnamed HYSTASPES—the Gushtasp of the Persians—(521–485 B.C.), mounted the throne. He was a politic and energetic prince, and succeeded in firmly establishing his dynasty, and adding Thrace and Macedonia to his empire; but his two attempts to subdue Greece were completely foiled, the first by the Thracians, and the second by the Athenians at Marathon (490 B.C.). His son, XERXES I. (485–465 B.C.)—the Isfundear of the Persians—renewed the attempt to subdue the Greek states, and though at first successful, the defeats of Salamis and Platæa compelled him to limit himself to a defensive warfare, which exhausted the resources of his kingdom. His son, ARTAXERXES I. (465–425 B.C.), surnamed LONGIMANUS (the Bahman of the Persians, better known as Ardeshir Dirazdust), was a valiant prince, but he was unable to stay the decadence of Persia, which had now commenced. He, however, crushed a formidable rebellion in Egypt, though his wars with the Greeks and Ionians were unsuccessful. The empire now became a prey to intestine dissensions, which continued during the reigns of his successors, Xerxes II., Sogdianus, Darius II., Artaxerxes II., and Artaxerxes III. DARIUS III., CODOMANNUS (336–329) (the Darab II. of the Persians), the last of the dynasty, was compelled to yield his throne to Alexander (q.v.) the great, king of Macedon (known as Secunder by the Persians), who reconquered all the former provinces of Persia, and founded a vast empire, which, at his death in 324 B.C., was divided into four parts, Persia along with Syria falling to the share of the Seleucidæ (q.v.), and its old dependency, Egypt, to the Ptolemies (q.v.). The Seleucidæ soon lost Bactria (now Balkh), which became independent under a series of Greek sovereigns; and about 246 B.C., Parthia (q.v.)—now northern Khorassan—also rebelled under ARSACES I. (the Ashk of the Persian writers), who founded the dynasty of the Arsacidæ, under whom the greater part of Persia was wrested from the Greeks, and maintained against both the Greeks and Romans. The Greek empire of Bactria, which is said to have included a great part of Hindustan, was overthrown by an influx of nomad tribes from Turkistan, and these invaders having been driven out by the Parthians, Bactria was added to their empire. But the dynasty of the Arsacidæ was brought to an end by a Persian named Ardeshir Babegan, who managed to gain possession of Fars, Kerman, and nearly the whole of Irak, before Arduan, the Parthian king, took the field against him. At last, a great battle was fought (218 A.D.) on the plain of Hormuz, in which the Persians were completely victorious. Babegan was now hailed as Ardeshir, king of Persia, and "Shahan Shah," or king of kings. The history of this dynasty will be found under the head of SASSANIDÆ. The Sassanian kings raised Persia to a height of power and prosperity such as it never before attained, and more than once periled the existence of the eastern empire. The last king was driven from the throne by the Arabs (636 A.D.), who now began to extend their dominion in all directions; and from this period may be dated the gradual change of character in the native Persian race, for they have been from this time constantly subject to the domination of alien races. During the reigns of Omar (the first of the Arab rulers of Persia), Othman, Ali, and the Ommiades (634–750), Persia was regarded as an outlying province of the empire, and was ruled by deputy governors; but after the accession of the Abbaside dynasty (750 A.D.), Bagdad became the capital, and Khorassan the favorite province of the early and more energetic rulers of this race, and Persia consequently came to be considered as the center and nucleus of the caliphate. But the rule of the caliphs soon became merely nominal, and ambitious governors, or other aspiring individuals, established independent princi-

PERSIA.—1. Hall of Xerxes, Persepolis (restored) 2. Rock tomb of Darius. 3. Grave of Cyru
Persia (1700). 7. Persian, (beginning of 18th century). 8. Market-place at Ispahan (1700
of life; 14. chariot (ancient sculpture). 15. Capital from Persepolis. 16. Persian woma





4. Persian funeral service (modern). 5. Persian woman (about 1700). 6. King of
D.). 9, 10. Aucient Persian vessels. 11. Persian flag. 12. Persian grave. 13. Tree
street costume.

palities in various parts of the country. Many of these dynasties were transitory, others lasted for centuries, and created extensive and powerful empires. The chief were the TAHERITES (820–72), a Turkish dynasty in Khorassan; the SOFFARIDES (Persian, 869–903), in Seistan, Fars, Irak, and Mazanderan; the SAMANI, in Transoxiana, Khorassan, and Seistan; the DILEMI (Persian, 933–1056), in western Persia; and the Ghiznevides (q.v.), in eastern Persia. These dynasties supplanted each other, and were finally rooted out by the Seljuks (q.v.), whose dominion extended from the Hellespont to Afghanistan. A branch of this dynasty, which ruled in Khaurezm (now Khiva, q.v.) gradually acquired the greater part of Persia, driving out the Ghiznevides and their successors the Ghurides (see GHÛRI); but they, along with the numerous petty dynasties which had established themselves in the south-western provinces, were all swept away by the Mongols (q.v.) under Genghis-khan (q.v.) and his grandson, Hulaku-khan, the latter of whom founded a new dynasty, the PERSO-MONGOL (1253–1335). This race becoming effeminate, was supplanted by the EYLKHANIANS in 1335, but an irruption of the Tartars of Turkistan under Timur (q.v.) again freed Persia from the petty dynasties which misruled it. After the death of Timûr's son and successor, shah Rokh, the Turkomans took possession of the western part of the country, which, however, they rather preyed upon than governed; while the eastern portion was divided and subdivided among Timûr's descendants, till, at the close of the 15th c., they were swept away by the Uzbeks (q.v.), who joined the whole of eastern Persia to their newly founded khanate of Khiva. A new dynasty now arose (1500) in western Persia, the first prince of which (Ismail, the descendant of a long line of devotees and saints, the objects of the highest reverence throughout western Persia), having become the leader of a number of Turkish tribes who were attached by strong ties of gratitude to his family, overthrew the power of the Turkomans, and seized Azerbijan, which was the seat of their power. Ismail rapidly subdued the western provinces, and in 1511 took Khorassan and Balkh from the Uzbeks; but in 1514 he had to encounter a much more formidable enemy—to wit, the mighty Selim (q.v.), the sultan of Turkey, whose zeal for conquest was further inflamed by religious animosity against the Shiites, or "Sectaries," as the followers of Ismail were termed. The Persians were totally defeated in a batttle on the frontiers; but Selim reaped no benefit from his victory, and after his retreat, Ismail attacked and subdued Georgia. The Persians dwell with rapture on the character of this monarch, whom they deem not only to be the restorer of Persia to a prosperous condition, and the founder of a great dynasty, but the establisher of the faith in which they glory as the national religion. His son Tamasp (1523–76), a prudent and spirited ruler, repeatedly drove out the predatory Uzbeks from Khorassan, sustained without loss a war with the Turks, and assisted Homayun, the son of Baber, to regain the throne of Delhi. After a considerable period of internal revolution, during which the Turks and Uzbeks attacked the empire without hindrance, shah Abbas I. the great (1585–1628), ascended the throne, restored internal tranquillity, and repelled the invasions of the Uzbeks and Turks. In 1605 he inflicted on the Turks such a terrible defeat as kept them quiet during the rest of his reign, and enabled him to recover the whole of Kurdistan, Mosul, and Diarbekir, which had for a long time been separated from Persia; and in the east, Candahar was taken from the great Mogul. Abbas's government was strict, but just and equitable; roads, bridges, caravansaries, and other conveniences for trade, were constructed at immense expense, and the improvement and ornamentation of the towns were not neglected. Ispahan more than doubled its population during his reign. His tolerance was remarkable, considering both the opinions of his ancestors and subjects; for he encouraged the Armenian Christians to settle in the country, well knowing that their peaceable and industrious habits would help to advance the prosperity of his kingdom. His successors, shah Sufi (1628–41), shah Abbas II. (1641–66), and shah Soliman (1666–94), were undistinguished by any remarkable talents, but the former two were sensible and judicious rulers, and advanced the prosperity of their subjects. During the reign of sultan Hussein (1694–1722), a weak, bigoted fool, priests and slaves were elevated to the most important offices of the empire, and all who rejected the tenets of the Shiites were persecuted. The consequence was a general discontent, of which the Afghans (see AFGHANISTAN) took advantage by declaring their independence, and seizing Candahar (1709). Their able leader, Meer Vais, died in 1715; but his successors were worthy of him, and one of them, Mahmud, invaded Persia (1722), defeated Hussein's armies, and besieged the king in Ispahan, till the inhabitants were reduced to the extremity of distress. Hussein then abdicated the throne in favor of his conqueror, who, on his accession, immediately devoted his energies to alleviate the distresses and gain the confidence of his new subjects, in both of which objects he thoroughly succeeded. Becoming insane, he was deposed in 1725 by his brother Ashraf (1725–29); but the atrocious tyranny of the latter was speedily put an end to by the celebrated Nadir shah (q.v.), who first raised Tamasp (1729–32) and his son, Abbas II. (1732–36), of the Suffavean race, to the throne, and then, on some frivolous pretext, deposed him, and seized the scepter (1736–47). But on his death, anarchy again returned; the country was horribly devastated by the rival claimants for the throne; Afghanistan (q.v.) and Beloochistan (q.v.) finally separated from Persia, and the country was split up into a number of small independent states till 1755, when a Kurd, named Kerim-khan (1755–1779), abolished this state of affairs, re-established peace and unity in western Persia.

and by his wisdom, justice, and warlike talents acquired the esteem of his subjects, and the respect of neighboring states. After the usual contests for the succession, accompanied with the usual barbarities and devastations, Kerim was succeeded in 1784 by Ali-Murad, Jaafar, and Luft-Ali, during whose reigns Mazanderan became independent under Aga-Mohammed, a Turkoman eunuch of the Kajar race, who repeatedly defeated the royal armies, and ended by depriving Luft-Ali of his crown (1795). The great eunuch-king (as he is frequently called), who founded the present dynasty, on his accession announced his intention of restoring the kingdom as it had been established by Kerim khan, and accordingly invaded Khorassan and Georgia, subduing the former country almost without effort. The Georgians besought the aid of Russia; but the Persian monarch, with terrible promptitude, poured his army like a torrent into the country, and devastated it with fire and sword; his conquest was, however, hardly completed when he was assassinated, May 14, 1797. His nephew, Futteh-Ali (1797–1834), after numerous conflicts) fully established his authority, and completely subdued the rebellious tribes in Khorassan, but the great commotions in western Europe produced for him bitter fruits. He was dragged into a war with Russia soon after his accession, and by a treaty, concluded in 1797, surrendered to that power Derbend and several districts on the Kur. In 1802 Georgia was declared to be a Russian province. War with Russia was recommenced by Persia, at the instigation of France; and, after two years of conflicts disastrous to the Persians, the treaty of Gulistan (Oct. 12, 1813) gave to Russia all the Persian possessions to the n. of Armenia, and the right of navigation in the Caspian sea. In 1826 a third war, equally unfortunate for Persia, was commenced with the same power, and cost Persia the remainder of its possessions in Armenia, with Erivan, and a sum of 18,000,000 rubles for the expenses of the war. The severity exercised in procuring this sum by taxation so exasperated the people that they rose in insurrection (Oct. 12, 1829), and murdered the Russian ambassador, his wife, and almost all who belonged to or were connected with the Russian legation. The most humiliating concessions to Russia, and the punishment by mutilation of 1500 of the rioters, alone averted war. The death of the crown-prince, Abbas-Mirza (q.v.), in 1833, seemed to give the final blow to the declining fortunes of Persia, for he was the only man who seriously attempted to raise his country from the state of abasement into which it had fallen. By the assistance of Russia and Britain, Mohammed-shah (1834–48), the son of Abbas-Mirza, obtained the crown. He conceived ambitious ideas of annexation. In the days of Nadir-shah, and indeed at many other periods, the Persian frontier had extended over a great part of the Afghan, Belooch, and Khivan boundary. Mohammed resolved to demand reacknowledgment of sovereignty from his alleged vassals in these countries, but an attempt he made to re-annex Herat, "the key to India," was resisted by England. The war was terminated in 1838 by the landing of a small sepoy force on the shores of the Persian gulf. Nasr-ed-din succeeded to the throne on his father's death in 1848; and the new government announced energetic reforms, but failed as completely as those which had preceded it in carrying them out. Following his father's example, the new shah resolved to reassert his claims in Afghanistan and Beloochistan. The ruler of Herat having recognized the claims of Persia, the English government remonstrated with the shah, and he was compelled to sign an engagement on Jan. 25, 1853, by which he became bound not to interfere further with the internal affairs of Herat. In Oct., 1856, however, on the pretext that Dost Mohammed, the ameer of Cabul, was about to invade Herat, the Persians again took the city. Having thus violated the terms of the treaty with Britain, war was declared against them, and a British army was landed on the coast of the gulf, which, under gens. Outram and Havelock, repeatedly defeated the Persians, and compelled them to restore Herat (July, 1857). In 1868 the Persians occupied Seistan, a province claimed by the Afghans, and extended their jurisdiction over the western third of the country appearing on our maps as Beloochistan. To put an end to the incessant strife to which these pretensions gave rise, the Persians at length agreed with the ameer of Afghanistan and the khan of Kelat to refer the questions in dispute to an English commissioner. Gen. sir Frederick Goldsmid accordingly visited the eastern frontier of Persia, and in 1872 delivered his award. It carried the Belooch frontier back from 58° to 63° e. long., so as to include in Persia the inland town of Jalk, and Guadar on the Indian Ocean. In 1870 the Russians admitted that the jurisdiction of Persia should extend over the whole basin of the Atrek. In 1873 Nasr-ed-din visited several of the European courts; in 1878 he visited Russia; and in 1889 again made a tour in Europe. As a ruler he was energetic and severe. His policy was largely under the influence of the Russian court, though for a time after the failure of his attempt to restore the Persian dominion over Herat, he maintained a somewhat friendly attitude toward Great Britain. He put down revolts and conspiracies with a high hand, but, through the sale of the tobacco monopoly to English speculators, he offended many of his subjects, and his unpopularity was increased by the scarcity of food in several of the provinces in subsequent years. In 1896 a *mollah*, an adherent of a seditious sect, who had been banished from Persia in 1891, shot and killed the Shah while the latter was entering a shrine near Teheran (May 1st). His son, Muzaffer-ed-din, was soon afterwards proclaimed Shah, on June 8th, and the murderer of his father was hanged a few weeks later. The new Shah reduced the taxes on food, proclaimed that public office should henceforth be awarded

on merit, and without consideration of money, and declared that he would rule without a grand-vizier, assuming himself the presidency of the cabinet of 12 ministers.

See *History of Persia from* 1800 *to* 1858, by R. G. Watson (Lond., 1873); *History of Persia*, by G. Clements R. Markham (1874); *Central Asia and the Anglo-Russian Frontier Question*, by A. Vambery (1874); and J. Keltie's *Statesman's Year-Book;* also Bassett's *Persia* (1886); S. G. W. Benjamin's *Persia and the Persians* (1886); Will's *Persia As It Is* (1886); Curzon's *The Karun River* (1890); Bird, *Journeys in Persia and Kurdistan* (1893); Browne, *A Year Amongst the Persians* (1893); Harris, *From Batum to Bagdad* (1896); Gordon, *Persia Revisited 1895* (1896), and Weeks, *From the Black Sea Through Persia and India* (1896).

PERSIAN ARCHITECTURE. The architecture of Persia is of considerable interest, both on its own account and as supplementary to and explanatory of that of Assyria, which, together with the similar edifices in Egypt, is the earliest architecture of which we have any knowledge. The buildings of Persia and Assyria closely resemble one another, and, owing to the mode and the materials in which they were constructed, their remains serve to illustrate and complete each other's history. In Assyria, where no solid building-materials exist, the walls are composed of masses of sun-dried brickwork, lined on the inside, to a certain height from the floor, with large sculptured slabs of alabaster. These have been preserved to us by the falling in of the heavy earthen roofs, with which, as the later Persian buildings explain to us, the Assyrian palaces were covered. The explorations of Layard and Botta, and the specimens brought home by the former, and now in the British museum, have made these sculptures familiar to us. The subjects usually are large bulls with human or lions' heads; priests with human bodies, and eagles' or lions' heads, performing religious service before the "sacred tree." The Assyrian remains are all of palace-temples, buildings somewhat resembling the Egyptian temples (which were also palaces); and many of the sculptures represent the exploits of the king in war and in peace. The palaces are always raised on lofty artificial mounds, and approached by magnificent flights of steps.

The buildings of Assyria extend over a very long period, the oldest at Nimroud being from 1300 to 800 B.C., and the more recent at Khorsabad and Koyunjik from 800 to 600 B.C. To these succeeded Babylon in the reign of Nebuchadnezzar, and the Birs Nimroud; but these are mere masses of decomposed brickwork, without any sculptures of harder material.

After Babylon came Pasargadæ—where the splendid palaces of Cyrus and Cambyses still exist in ruins—and Persepolis, the capital of Darius and Xerxes (560–23 B.C.), and some remains are still to be found at Susa, Ecbatana, and Teheran. At Persepolis we find the very parts preserved which at Nimroud and Khorsabad are wanting; for here there is abundance of stone, and the pillars, walls, doorways, etc. (which, in the early examples, were no doubt of wood, and have decayed) being of stone, are still preserved. This has enabled Mr. Fergusson to "restore" these buildings, and to produce most interesting designs, showing not only how the palaces of Persia were constructed and lighted, but from them to suggest how the arrangements of all the ancient architecture of Egypt and Syria must have been designed.

The halls at Persepolis were square in plan, having an equal number of pillars in each direction for the support of the roof, which was flat. In the center a portion was left open for the admission of light, and sheltered by another roof raised upon pillars. The great hall of Xerxes is the most splendid building whose remains exist in this part of the world. The remains of the 72 columns with which it was adorned, are still extant. The hall had 36 columns, six on each side, and on three sides had an external portico, each with two rows of six columns. These columns had capitals, composed of bulls' heads and shoulders (Fig. 1), between which the beams of the roof rested; while others were ornamented with scrolls like the Ionic order (Fig. 2). The bases are also suggestive of the origin of that Greek style. This hall was 350 ft. by 300, and covered more ground than any similar buildings of antiquity, or any mediæval cathedral except that of Milan. The palaces of Persepolis stand on lofty platforms, built with walls of Cyclopean masonry, and approached by magnificent flights of stairs, adorned, like the palaces, with sculptures somewhat similar to those of Assyria. The interiors were ornamented with paintings. The use of the arch was known in Assyria, as has been shown by the subterranean arched conduits discovered by Layard, and

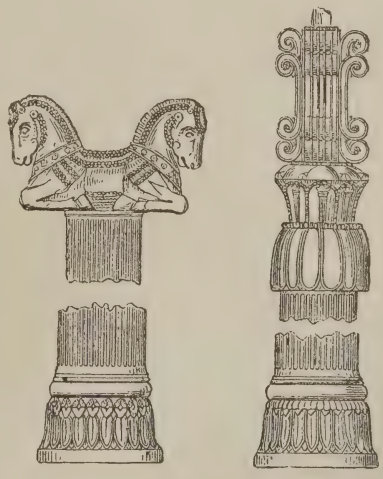


Fig. 1. Fig. 2.

Details of Persian Architecture.

the gates of Khorsabad discovered by M. Place. The arches of the latter spring from the backs of sculptured bulls, and are beautifully ornamented with enameled bricks.

PERSIAN GULF, an arm of the Indian ocean which penetrates between Arabia and Persia to the extent of 420 English m. in a general north-westerly direction. Its depth varies between 20 and 45 fathoms. Its breadth varies from 105 m. to 250 m., and the area is estimated at 117,300 sq. m., from which about 1930 sq. m. must be subtracted for the islands, which are scattered over the western half, or lie close inshore along the eastern side. The chief of these islands are Ormuz (q.v.), at the mouth, Kishm, and the Bahrein islands (q.v.), around which last a considerable pearl fishery is carried on. The coast is mostly formed of calcareous rocks. On the Arabian side it is low and sandy, occasionally broken by mountains and cliffs; while, on the Persian side, it is higher and abrupt, with deep water close inshore, owing to the mountain-ranges of Fars and Laristan running close to the water's edge. The islands are partly of limestone and partly of ironstone, and are generally destitute of springs, barren, desolate, and presenting numerous traces of volcanic eruptions. With the exception of the Shat-el-Arab, which is formed by the confluence of the Tigris and Euphrates (q.v.), the Persian gulf receives only insignificant streams. Its eastern side presents abundance of good anchorage, either in the numerous bays or in the lee of islands. Persia has three quite important ports on her shore of the gulf—viz., at Bunder Abbas, Bushire, and Singali. A submarine telegraph cable extends from the Euphrates to Karachi. The order of the periodic currents in this gulf is precisely the reverse of that of the Red sea (q.v.) currents, as they ascend from May to October, and descend from October to May.

Oriental geographers give to this gulf the name of the "Green sea," from a remarkable strip of water, of a green color, which lies along the Arabian coast. It is strange that from the time of Nearchus, the admiral of Alexander the Great, who was the first to make the Persian gulf known to Europeans, the Persians have never ruled supreme over its surface.

PERSIAN LANGUAGE AND LITERATURE. The ancient and modern idioms of Persia, which are in general designated as Iranian or West Aryan, belong to the great class of the Indo-Germanic languages; but the term Persian itself applies more particularly to the language as it is now spoken, with a few exceptions, throughout Persia, and in a few other places, formerly under Persian dominion, like Bokhara, etc. The more important and better known of the ancient idioms are (1) the *Zend* (the East Iranian or Bactrian language, in two dialects—the "Gâtha idiom," and the "ancient" or "classical Zend"), which died out in the 3d c. B.C.—one of the most highly developed idioms, rich in inflections, in the verbs as well as in the nouns, and in the former almost completely agreeing with Vedic Sanskrit; yet such as we find it in the small remains which have survived, it is no longer in the full vigor of life, but almost decaying, and grammatically somewhat neglected; it is in fact held by a great authority on the subject (Haug), that the grammar was never fixed in any way by rules. To increase the difficulty still more, the texts—the Zoroastrian books—never seem to have been copied with proper care, or by men who had any correct knowledge of the language; so that the critical restoration of the literary remains is matter of extreme difficulty, and Zend studies in general may be said to be in their infancy yet. Geographically, this idiom may be placed in northern Persia. Its alphabet is of Semitic origin, and the writing goes from right to left (see AVESTA, ZOROASTER). (2) *Ancient Persian*, the chief remnants of which are found in the cuneiform inscriptions of the time of the Achæmenides, discovered in the ruins of Persepolis, on the rock of Behistun, and some other places of Persia (see CUNEIFORM). Some relics, chiefly consisting of proper names for gods and men, and terms for vessels and garments, have survived in the writings of the classical period, and in the Bible, chiefly in Daniel. This idiom is much nearer to Zend and Sanskrit than to modern Persian. It has still the structure of an ancient organic Indo-Germanic language, with the distinct peculiarities of an Iranic tongue. (3) *Pehlevi* (q.v.) (West Iranian, Median, and Persian), in use during the period of the Sassanides (3d to 7th c. A.D.), an idiom largely mixed with Semitic words, and poorer in inflections and terminations than Zend. Its remnants consist of a certain number of books relating to the Zoroastrian religion, of coins and inscriptions; and the language is not quite the same in all cases—according to the larger or smaller infusion of foreign words. The non-Iranian element is known as Huzvaresh, and is simply Chaldee; while the Iranian element is but little different from modern Persian. There are three distinct idioms to be distinguished in Pehlevi, and the writing varies accordingly, yet it is not certain whether the difference arises from their belonging to different districts or periods. When, however, Pehlevi ceased to be a living language, and the restoration of the pure Iranian had begun, people, not daring to change the writings, chiefly of a sacred nature, as they had descended to them from the Sassanian times, began to substitute, in reading, the Persian equivalents to the Huzvaresh words. At last a new form of commentaries to the sacred writings sprang up, in which more distinct and clear Zend characters were used, where each sign has but one phonetical value, and where all the foreign Huzvaresh words were replaced by pure Persian ones; and this new form was called (4) *Pâzend*. The transition from the ancient to the

modern Persian is formed by the *Parsee*, or, as the Arabs call it, *Farsi*, in use from 700 to 1100 A.D., once the language purely of the south-western provinces, and distinguished chiefly by a peculiarity of style, rigid exclusion of Semitic words, and certain now obsolete forms and words retained in liturgic formulas. It is the Persian once written by the Parsees or fire-worshipers, and is in other respects very similar to the present or *modern Persian*, the language of Jâmi, Nizâmi, and Hâfiz—from 1100 to the present time—with its numerous dialects. The purest dialect is said to be that spoken in Shiraz and Ispahan and their neighborhood. In general, the language is pronounced by universal consent to be the richest and most elegant of those spoken in modern Asia. It is the most sonorous and muscular, while at the same time it is the most elegant and most flexible of idioms; and it is not to be wondered at that, throughout the Moslem and Hindu realm, it should have become the court language, and that of the educated world in general; holding a position somewhat similar to that which the French language held up to within a recent period in Europe. Its chief characteristic, however, is the enormous intermixture of Arabic words, which, indeed, almost make up half its vocabulary. Respecting its analytical and grammatical structure, it exhibits traces only of that of the ancient dialects of Zend and Achæmenian, of which it is a direct descendant. The elaborate system of forms and inflections characteristic of those dialects has been utterly abandoned for combinations of auxiliary words, which form independent connective links, and which impart fullness and an incredible ease to speech and composition, but which, at the same time, correspond as little to the classical notion of inflection. The grammar of the Persian language has been called "regular;" but the fact is, that there is hardly any grammar worth mentioning—at all events, no grammar the rules of which could not be mastered in the briefest possible period. To begin with: there is no gender distinguished in declension; the plural is always formed in the same manner, the only distinction consists in animate beings receiving the affix *ân*, while the inanimate are terminated in *hâ;* further, that instead of the inflection in the different cases found in the ancient languages, either a *mar* (hitherto unexplained) is prefixed, or a *râ* (*râh* = way, by reason of, Pehlevi, Parsi) is affixed. Between the genitive and the word which governs it, also between a noun and its following adjective, an *i* is inserted. This is the whole declension, not only of the noun, but also of the adjective and pronoun. The comparative is formed, as in the mother-tongues, by the addition of *ter;* the superlative adds *terîn*, which is New-Persian exclusively. Not even the pronouns have a gender of their own; the distinction between masculine and feminine must be expressed by a special word, denoting male or female. There is no article, either definite or indefinite. Singularity of a noun is expressed by an appended *ê*, a remnant of *aêva*, one. The flection of the verb is equally simple. There is a set of personal terminations for all tenses: *am, i, ad* or *ast; êm, êd, nd;* the infinitive ends in *tan* or *dan*, the past participle in *tah* or *dah*. The aorist is formed by adding to the root the terminations *am, i, ad; em, ed, and;* the preterite by dropping the *n* of the infinitive, and substituting the usual terminations. The prefix *mi* or *hami* (Parsi and Huzvaresh = always) transforms the preterite into the imperfect; while the prefix *bi* or *bih* (the present of the verb "to will") alters the aorist into the simple future. The other tenses are compounds of the past participle and auxiliary verbs, as in the Teutonic and other modern tongues. The passive is formed by the various tenses of the verb *shudan*, "to be, to go, to beware," being placed after the past participle. As to syntax, there is none, or, at all events, none which would not come almost instinctively to any student acquainted with the general laws of speech and composition. As the time of its greatest brilliancy may be designated that in which Firdusi wrote, when Arabic words had not swamped it to the vast degree in which it is now found, and were still, as far as they had crept in, amenable to whatever rules the Persian grammar imposed upon the words of its own language.

In the history of the Persian writing, three epochs are to be distinguished. First, we have the cuneiform (q.v.), by the side of which there seems, however, to have been in use a kind of Semitic alphabet for common purposes. This, in the second period, appears to have split into several alphabets, all related to each other, and pointing to a common Syriac origin (such as the different kinds of Pehlevi characters and the Zend alphabet) cleverly adapted to the use of a non-Semitic language. In the third period, we find the Arabic alphabet enlarged for Persian use by an addition of diacritical points and signs for such sounds as are not to be found in Arabic (*p, ch, zh, g*). The characters are written in a somewhat more pending manner (Talik) in Persian, and the writing is thus slightly different from the usual Arabic Neskhi.

The much-spoken-of close connection between German and Persian—both of Indo-Germanic kin—is neither more nor less than a popular fallacy, caused by a misunderstood dictum of Leibnitz: "Integri versus Persice scribi possunt quos Germanus intelligat," which was enthusiastically taken up and "proved" by Adelung, Hammer-Purgstall, and others, and which has even led to the assumption, that the Germans came direct from Persia, or that the Goths once were mixed with the Persians. We only mention it as a philological absurdity of bygone days.

Of the literature of the Persians before the Mohammedan conquest, we shall not speak here, but refer to the special articles AVESTA, PEHLEVI, PARSEES, etc. The literary period now under consideration is distinguishable by the above-mentioned infusion of Arabic

words into the Persian language, imported together with the Koran and its teachings. The writers are, in fact, one and all, Mohammedans. With the fanaticism peculiar to conquering religions, more particularly to Islam, all the representatives of old Persian literature and science, men and matter, were ruthlessly persecuted by Omar's general, Saad Ibn Abi Wakkas. The consequence was, that for the first two or three centuries after the conquest, all was silence. The scholars and priests who would not bow to Allah and his prophet and to the new order of things, and who had found means to emigrate, took with them what had not been destroyed of the written monuments of their ancient culture; while those that remained at home were forced to abandon their wonted studies. Yet, by slow degrees, as is invariably the case under such circumstances, the conquered race transformed the culture of the conquerors to such a degree, that native influence soon became paramount in Persia, even in the matter of theology—the supreme science. It is readily granted by later Mohammedan writers, that it was out of the body of the Persians exclusively that sprang the foremost, if not all, the greatest scholars and authors on religious as well as grammatical subjects, historians and poets, philosophers and men of science; and the only concession they made consisted in their use of the newly imported Arabic tongue. A further step was taken when, after the Islam sway had ceased, the Persians, under upstart native dynasties, returned also to the ancient language of their fathers during the first centuries of Mohammedanism. The revived national feeling, which must have been stirring for a long time previously among the masses, then suddenly burst forth in prose and in verse, from the lips of a thousand singers and writers. The literary life of Persia, the commencement of which is thus to be placed in the 9th c. A.D., continued to flourish with unabated healthy vigor for five centuries, and produced a host of writers in every branch of science and belles-lettres, of whom we can only here give the most rapid of surveys, referring for the most important names to the special articles throughout this work. Beginning with poetry, we hear, under the rule of the third of the Samanides, Nasr (about 952), of Abul Hasan Rudegi, the blind, who rose by the king's favor to such an eminence that he had 200 slaves to wait upon him. But little has remained of his 1,300,000 distichs, and of his metrical translation of Bidpai's fables. About 1000 A.D., we hear of Kabus, the Dilemite prince, as the author of *The Perfection of Rhetoric*, and poems. In the time of the Gasnevides, chiefly under Mahmud, who surrounded himself with no less than 400 court-poets, we find those stars of Persian song, Ansari (1039), the author of *Wamik and Asra*, and 30,000 other distichs and Kassidahs in honor and praise of the king; further, Ferruchi, who, besides his own poems, also wrote the first work on the laws of the Persian metrical art; and above all Firdusi (q.v.), that greatest epic poet, the author of the *Shah-Nameh*, or Book of Kings; who led one of the most brilliant and romantic lives that ever fell to the lot of genius, and ended it forgotten and in misery. With him, but darkened by his brightness, flourished Esedi, his countryman, from Tus. Among the poets who flourished under the Atabek dynasty, we find that most brilliant Persian panegyrist, Anhad Addin Enweri, who, with his praise, well knew how to handle satire. The best of the older mystic poets of that period is Senayi, author of 30,000 distichs, who for his poem *Hadikat* was nominated official singer of the Sufis. Nizami (about 1200) is founder of the romantic epos; the greater part of his *Chamshe*, or collection of five romantic poems (*Chosru and Shirin, Mejnun and Leila*, etc.), being almost as well known in Europe as it is in the east; and to whom Kisilarslan the king presented for one of these poems no less than fourteen estates. His grave at Gendsheh is still visited by many a pious pilgrim. And here we must mention that the branch of eastern theosophical literature pre-eminently cultivated in Persia is the mystic (Sufistic) poetry, which, under Anacreontic allegories, in glowing songs of wine and love, represented the mystery of divine love and of the union of the soul with God (see SUFISM). In this province we find chiefly eminent poets like Senâji (about beginning of 13th c.), and Ferid Eddin Attar (born 1216), the renowed author of *Pend Nameh* (Book of Counsel), a work containing the biographies of saints up to his day. His principal strength, however, lay in his mystic poems; and such is the depth and hidden meaning of his rhymes, that for centuries after him, the whole Moslem world has busied itself with commentaries and conjectures on the meaning of a great part of his sacred poetry. He died about 1330, more than a hundred years old, as a martyr. Greater still, in this peculiar field, is Djalal Eddin Rumi, born at Balkh (died 1266), the founder of a still existing most popular order of dervishes (Mewlewi). His poem on *Contemplative Life* has made him the oracle of oriental mysticism up to this day. He wrote also a great number of lyrical poems, which form, as far as they have been collected for this special purpose, a breviary for the faithful Sufi. Anhadi of Meraga (died 1297) also deserves mention.

The 13th c. cannot better be closed than with Sheik Muslih Eddin Sadi of Shiraz (died 1291), the first and unrivaled Persian didactic poet. His *Bostan* and *Gulistan* (rose and fruit garden) are not only of eastern but also of European celebrity, and most deservedly, embodying as they do all the mature wisdom, the grace, and happiness of composition of a true poet, ripe in years as in experience. At the beginning of the 14th c., we meet several meritorious imitators of Sadi in didactic poetry.

But far above all these, as above all other Persian lyrical and erotic poets, shines Hâfiz (q.v.), the "sugar-lip," who sang of wine and love, and nightingales and flowers.

and who so offended mock-piety that it even would have tried to refuse him a proper burial, had not the oracle of the Koran interposed. After him, the full glory of Persian poetry begins to wane. Among those that came after him, stands highest Djâmi, who died in 1492, a poet of most varied genius, second only in every one of the manifold branches to its chief master—in panegyric to Enveri, in didactic to Sâdi, in romance to Nizami, in mysticism to Jelal-ed-din, in lyric to Sâdi; and he, with these and Firdusi, form the brightest representatives of Persian poetry. Most brilliant, however, is Djâmi as a romantic poet. Of prose works, we have by him a history of Sufis, and an exceedingly valuable collection of epistolary models. Before concluding this branch of literature, we must take notice of the dramatic poetry of the Persians, which is not without merit, but of small extent, and to be compared principally with the ancient French mysteries.

The numerous tales, stories, novels, anecdotes, anthologies, and all the miscellaneous entertaining literature in which Persia abounds—and of which the best known, perhaps, are the adaptation of Bidpai's fables; *Anvari Suheili*, by Husein Vais Kashifi; the *Tutinameh*, or book of parrots, a collection of fairy tales, by Nechshebi; the *Behari-Danish*, by Inajeth Allah, etc.—form a fit transition from poetry to prose, for little more is to be said of Persian poetry after the 15th century. Modern imitations of ancient classical works, such as the New Book of Kings, the *Shahinshah-Nameh*, which treats of modern Persian history; the *George Naméh*, which sings the English conquests in India, etc., are hardly worth pointing out in so brief a summary as ours. Of native writers on the poets, are to be named Dewlet Shah (who describes the poets from the 10th to the 15th c.), Sam Mirsa (the poets of the 16th); and Luft Ali Beg (the poets of modern time). In prose, it is chiefly history which deserves our attention. Able rivals of the great Arabic historiographers sprang up at an early period. For the mythical times, or those of which no knowledge, save through a medium of half-legend, has reached later generations, Firdusi's gigantic epos remains the only source. But after the chroniclers we find Fadhl Allah Reshid Eddin, the vizier of Ghazan, born 1247 at Hamadan, who was executed in 1320. He wrote the *Collector of Histories*, in three volumes, to which he afterwards added a fourth geographical volume: a summary of the history of all Mohammedan countries and times, containing besides a complete history of sects. Worthy and contemporaneous rivals are Fachr Eddin Mohammed Bina Kiti, author of a universal history; and Khodja Abdallah Wassaf, the panegyrist, the model of grand and rhetorical style. His most successful imitator in the 14th c. is Abdel Ressak; and in the 15th, Sheref Eddin Ali Yezdi, who wrote the history of Timûr. Up to that period, pomposity of diction was considered the principal beauty, if not the chief merit, of a classical Persian history. From the 15th c. downwards a healthy reaction set in, and simplicity and the striving after the real representation of facts became the predominant fashion. As the *facile princeps* among these modern historians is to be mentioned, Mirkhond, whose Universal History (*Ranset Essafa*) comprises the period from creation to the reign of Sultan Hasan Beikara, in seven books. After him are to be mentioned his son Khondemir, Gaffari, Moslih Eddin Mohammed Lari, and Abu Tahir, of Tortosa, in Spain, who wrote the *Derab Nameh*, a biographical work on the Persian and Macedonian kings, and the ancient Greek physicians and philosophers.

Among Indian historians—and they form a most important class—who wrote in Persian, we have Mohammed Kasim Ferishtah (1640), who wrote the ancient history of India up to the European conquest; Mohammed Hashim, Abul Fadel Mobarrek (*Akbar Nameh*); further, Abdel Ressak (*History of the Padishahs*), Mirza Mehdi, Gholam Hussein Khan, and others. One of the most recent works of this description is the *Measiri Sultaniye*, which contains the history of the present dynasty of Persia, and which was published in Teheran, 1825, and translated by Bridges (Lond. 1833).

Biographies, legends, histories of martyrs, and the like are legion. Most of the biographies of the prophet, however, are taken from the Arabic.

Little is to be said of Persian productions on special branches of exact science. There are a few works on geography—more generally treated together with history—such as those of Mestafi, Ahmîn Ahmed Rasi, Berdshendi, etc. In theology, little beyond translations of the Koran, and a few commentaries on single chapters, and of some portions of the Traditions (*Sunnah*), has been produced—the Arab works being completely sufficient, in religious matters, for all Mohammedans. For the history of early Persian religion are of importance the *Ulemai Islam* and the *Dabistan*, a description of all the creeds of the east. Jurisprudence has likewise to show little that is original, and not mere translation, partial commentary, or adaptation in Persian. The *Hedadshah*, the *Inadshah*, the *Futawa Alemgiri*, are the most important legal works to be mentioned here. A great deal has been done in the field of medicine, surgery, pharmacy, physical sciences, by Persians; but nearly all their chief works being written in Arabic, they do not concern us here. Mathematics, astronomy, and philosophy have received due attention; rhetoric, the art of letter-writing, metrical and poetical arts, have likewise been cultivated with great assiduity, but few standard works are to be enumerated. Grammar and lexicography found their principal devotees in India; and of dictionaries, the *Ferhengi-Shiuri*, *Burhani Katiu*, and principally the *Heft Kulzum* (the seven seas), by the sultan of Oude, deserve attention. Translations from Greek, Indian, Arabic,

Turkish, and other works into Persian, exist in great abundance, and some of them have paved the way to the knowlege of the original sources in Europe. Chief authorities and writers on the subject of Persian language and literature are Meninsky, Richardson, Lumsden, Forbes, Ibrahim De Lacy, Hammer-Purgstall, Briggs, Jones, Duperron, Stewart, Quatremere, Wilken, Defrémery, Vullers, Iken, Kosegarten, Ouseley, Chodzko, Bland, Sprenger, Graff, Brockhaus, Dorn.

PERSIAN POWDER, a preparation of the flowers of the composite plant, *pyrethrum carneum* or *roseum,* which are dried and pulverized. This powder has wonderful efficacy in destroying noxious insects, and is extensively used for that purpose in Russia, Persia, and Turkey. It has been introduced into France, America, and elsewhere, and has become of great use, not only in ridding houses of their insect pests, but in aiding the horticulturist in protecting his plants. The plant is a native of the Caucasus, where the flowers are gathered wild, and sent to be manufactured chiefly at Tiflis. Its habit is very similar to that of camomile. *Pyrethrum cinerariæ folium,* popularly called buhach, is cultivated in California for similar purposes.

PERSIGNY, Jean Gilbert Victor, Duc de, whose proper name was Fialin, a noted adherent of the emperor Napoleon III., was born at Saint-Germain-Lespinasse, in the department of Loire, Jan. 11, 1808, entered the *ecole de cavalerie* at Saumur in 1826, and obtained an appointment to the 4th regiment of hussars in 1828. At this period Fialin was royalist in his politics; but he soon changed to a liberal, and took an active part in the July revolution. Insubordination, however, led to his final expulsion from the army in 1830. After a brief trial of Saint-Simonianism, Fialin was converted to the Bonapartist cause, dropped the name of Fialin, and took up that of Persigny (from an "hereditary estate"), with the title of vicomte. Introduced to Louis Napoleon by the ex-king Joseph, he at once formed the most intimate relations with the prince, and commenced a career of Bonapartist propagandism throughout France and Germany, in which he displayed extraordinary energy, pertinacity, and fertility of resource. He had the chief hand in the affair of Strasburg, and subsequently apologized for its humiliating failure in a pamphlet entitled *Relation de l'Entreprise du Prince Napoléon Louis* (Lond. 1837), in which he throws the blame of the disaster on "fate." He also took part in the descent on Boulogne, where, like his master, he had the misfortune to be captured, and was condemned to twenty years' imprisonment. His confinement, however, after a short time, became almost nominal, and he beguiled his leisure by literary study, a partial result of which may be seen in his voluminous memoir, addressed to the institute, on the *Utilité des Pyramides d'Egypte* (1844). On the breaking out of the revolution in 1848 Persigny hurried to Paris, and set himself, with his accustomed vigor and swiftness, to organize the Bonapartists. It is hardly too much to affirm that it was this dexterous agitator who made his master president of the republic. He was then appointed aide-de-camp to the president, and maj.gen. of the Parisian national guard—perhaps with a view to future contingencies. In 1849 he was chosen a member of the legislative assembly, and immediately signalized himself in parliament, as he had previously done out of doors, by his absolute devotion to the policy of the Elysée. He was sent to Berlin as ambassador at the close of the same year, and afterward held other high diplomatic offices; took a prominent part in the *coup d'état* of Dec. 1851; and, in Jan. 1852, succeeded M. de Morny as minister of the interior. On the 27th of May following, he married a granddaughter of marshal Ney, when the president conferred on him the title of *comte,* and presented him with 500,000 francs. In 1855 he became ambassador at the English court, which office he held till 1858, and again during 1859 to 1860, leaving on both occasions the most favorable impression on English statesmen, by his talent and diplomatic tact. In the latter year he was recalled, to resume the office of minister of the interior. He laid down the portfolio of this office in June 1863, when the elections of Paris and other large towns showed dissatisfaction with his policy. In September of the same year he was created duke. Thereafter he proved himself in the senate a zealous Bonapartist, till the overthrow of the empire. He did not long survive it, having died in 1872.

PERSIMMON. See Date Plum.

PER'SIUS (Aulus Persius Flaccus), one of the most famous Roman satirists, was b. at Volaterræ in Etruria, 34 A.D. He was of a distinguished equestrian family, was educated under the care of the stoic, Cornutus, lived on terms of intimacy with the most distinguished personages of his time in Rome, among whom were Lucan and Seneca, and died Nov. 24, 62 A.D., in the 28th year of his age. The principal authority for the life of Persius is an abridgment of a "commentary" by one Probus Valerius, which presents the character of the satirist in a most amiable light. Modest and gentle in his manners, virtuous and pure in his whole conduct and relations, he stands out conspicuously from the mass of corrupt and profligate persons who formed the Roman "society" of his age; and vindicated for himself the right to be severe, by leading a blameless and exemplary life. His six satires are very commonly printed with those of Juvenal. They were immensely admired in Persius's own day, and long after, all down through the middle ages. The

church fathers, Augustine, Lactantius, and Jerome, were particularly fond of him—the latter, it is said, has quite saturated his style with expressions of the heathen satirist; but the estimate which modern critics have formed of his writings, in a literary point of view, is not quite so high. They are remarkable for the sternness with which they censure the corruption of morals then prevalent at Rome, contrasting it with the old Roman austerity and with the stoic ideal of virtue. The language is terse, homely, and sometimes obscure, from the nature of the allusions and the expressions used, but his dialogues are the most dramatic in the Latin tongue. The *editio princeps* appeared at Rome in 1470; later editions are those of Isaac Casaubon (Par. 1605), Passow (Leip. 1809), Jahn (Leip., 1843), and Conington (Lond., 1881). Persius has been frequently translated; as many as 14 English, 20 French, and considerably more German versions, being known. The two best English ones are those by Dryden and Conington.

PERSON (Lat. *persona*, a mask) has come, from its original signification, to be applied to the individual wearing the mask, and thus to mean in general an individual, or a numerically distinct being. Beyond the idea of individuality, it involves that of a sentient or intelligent nature, in which it differs from "substance" or "thing." The theological use of the word, although strictly identical with its philosophical signification, is made difficult of apprehension from its being applied to the Christian doctrine of the Trinity, which in itself involves a mystery. Nevertheless, when theologians declare that there are three persons in one God, they intend to strictly convey that each of the three persons is a being individually subsisting and numerically distinct; and the difficulty of apprehension is derived, not from these terms, but from the reconciliation of the numerical distinction of persons with the unity of the divine nature.

The name *persona*, person, was first applied to the Trinity by the Latins; the corresponding Greek word, *prosōpon*, being of later use. The earlier Greek fathers used the word *hypostasis*, substance, where the Latins used *persona*, and considerable controversy for a time grew out of this diverse use. It became apparent, however, that the difference was but of words; and after the condemnation of the Sabellian heresy (see Sabellius), and still more after the council of Nicæa, all ambiguity of words being at an end, the controversy turned upon the substance of the doctrine, in the well-known form of the Arian controversy. See Arius.

PERSONA GRATA (Lat., "an agreeable personage") is an expression used in diplomatic circles to indicate the standing of foreign ministers and ambassadors with the government to which they are accredited. If such an official is an approved representative at the court or capital to which he is sent, he is designated as *persona grata*, and as such is received. If, on the contrary, he have committed such social or political indiscretions as to render him, in the estimation of the government to which he is sent, ineligible for this office, he is considered as not being *persona grata*, and is either not received, or, having been received, is returned to his government. The Foreign Enlistment act issued by England during the Crimean war caused the British minister at Washington, Mr. Crampton, to outrun the limits of discretion in enlisting American recruits for the British army. His conduct in the matter became so offensive to our government that, being no longer *persona grata*, he was summarily dismissed from his post. So in April, 1891, Mr. H. W. Blair, of New Hampshire, who had been appointed by President Harrison, minister to China, was declared by the Chinese government to be *persona non grata*, because of certain public utterances of his on the Chinese question some years before; and, although on his way to China, our government was obliged to recall him.

PERSONAL ACTIONS, in American law, are actions which are brought to try the right to damages for breach of contract, or for injuries to the person or personal estate; in contradistinction to real actions, which were designed to try the right and title to real property.

PERSONAL EQUATION. See Equation, Personal.

PERSONAL EXCEPTION means, in the Roman law, a ground of objection which applies to an individual, and prevents his doing something which, but for his conduct or situation, he might do.

PERSONAL PROPERTY. Things personal may be divided into chattels, chattels real, and choses in action. Chattels comprehend all movable material objects not affixed to the soil. When attached to the soil so as to become a part of it, a chattel is converted into a fixture. See Fixtures. A chattel real is an interest annexed or relating to real estate, as a lease for years. The treatment of chattels real belongs to the law of real property, and they resemble personal property only in this respect, that upon the lessee's death the residue of his term goes to his executor or administrator, and not to the heirs. Any interest in real estate, whose continuance is limited to a certain period, i.e., which is less than a freehold, is a chattel real. Choses (things) in action are rights not enforceable without bringing action to recover a debt, or money or damages for breach of contract or for the commission of a tort connected with a contract. Properly speaking, these were not a species of property, but a right whose enforcement will give the holder a property right. The main legal distinction between real and personal property is that the latter, on the death of its owner, goes to his personal representa-

tives instead of his heirs Anciently, personal property of a deceased intestate went to the king; and afterwards the bishops succeeded to it, holding it absolutely, but being supposed to apply it to pious uses. The statute 13 Edward I., c. 19, ordered the payment by the bishops of the debts of intestates, and the statute 31 Edward III., c. 11, took the right of administration from the bishops and gave it henceforth to "the next and lawful friend of the deceased person intestate," whose appointment was made obligatory on the bishops. Up to the time of the statute of distributions (22 and 23 Charles II. c. 10), the administrator, after paying the debts, was allowed to keep the balance as his own. The statute of distributions compelled the distribution by the administrator of the surplus, under the court's order, among the next of kin, in a definite order. The statute of distributions, in all its main provisions, had been adopted by most of the states. Title to personal property is acquired by occupancy; by transfer by act of the party, as a sale; by transfer by act of the law, as by judgment; by accession, and by prescription.

PERSONALTY, in American law, means all the property which, when a man dies, goes to his executor or administrator, as distinguished from the realty, which goes to his heir-at-law. Personalty consists of money, furniture, stock in the funds; while realty consists of freehold land and rights connected with land. See Intestacy; Kin, Next of.

PERSONIFICATION (called by the Greeks *prosopopœia*) is a figure of rhetoric by which inanimate objects, or mere abstract conceptions, are invested with the forms and attributes of conscious life. Oratory and poetry often derive great power and beauty from the employment of this figure. Nowhere do we find more sublime examples than in the Hebrew Scriptures, e.g., "The sea *saw* it, and fled." Such abstract conceptions as wisdom, justice, charity, are often personified in the gravest and most argumentative compositions.

PERSONNEL, in speaking of an army, represents the officers and soldiers, as opposed to the *matériel,* in which are comprised the guns, provisions, wagons, and stores of every description.

PERSOON, Christian Hendrik, 1755–1837, a physician and botanist, was born of Dutch parents, at the Cape of Good Hope, Africa. He went to Paris about 1802, where he published several interesting works on cryptogamous plants; also, a *Synopsis of Plants* in two volumes.

PERSPECTIVE (Lat. *perspicio,* I look through), is the art of representing natural objects upon a plane surface in such a manner that the representation shall affect the eye in the same way as the objects themselves. The distance and position of objects affect both their distinctness and apparent form, giving rise to a subdivision of perspective into *linear perspective* which, as its name denotes, considers exclusively the effect produced by the position and distance of the observer upon the apparent *form* and *grouping* of objects; while *aërial perspective* confines itself to their *distinctness,* as modified by distance and light. The necessity of attending to the principles of perspective in all pictorial drawing is apparent when we consider, for instance, that a circle, when seen obliquely, appears to be not a circle, but an ellipse, with its shortest diameter in line with the spectator, and its longest at right angles to this. A square, when looked at from a position opposite the center of one of its sides, appears as a trapezoid, the sides which are perpendicular to the direction of vision appearing to be parallel, while the other two appear to converge to a point in front of the spectator, etc. For the same reason, two rows of parallel pillars of equal height, seen from a point between and equidistant from each row, appear not only to converge at the further end, but to become gradually smaller and smaller. An excellent idea of a perspective plan can be easily obtained by interposing a vertical transparent plane (as of glass—a window, for instance) between the observer and the objects of his vision, and supposing that the objects he sees are not seen *through* the glass, but painted *on* it. A sketch made on a glass plane in this position by following with a pencil all the lines and shades of the objects seen through it, the eye being all the time kept quite steady, would form a picture in perfect perspective. In practice, however, it is found, unfortunately, that glass is not a suitable material for sketching on, and that the vertical position is not the most convenient; it is therefore preferable to make a careful study of the effects produced by change of position and distance on the appearance of objects in nature, and, from the results of this to compile a body of rules, by the observance of which painters may be enabled to produce an effect true to nature. After the "scope" (i. e., the number of objects to be introduced, and the distance at which they are to be viewed) of the picture has been determined, and before the design is commenced, it is necessary to draw upon the perspective plan three lines: 1. The *base line,* or *ground line,* which limits the sketch towards the operator, and is the base line of the picture. 2. The *horizontal line,* which represents the ordinary position of the sensible horizon. The height of the horizontal line is about one-third of the height of the picture, when the sketcher is placed at or little above the level of the horizon; but it may rise in a degree corresponding to his increase of elevation till it reaches near to the top of the perspective plan. The general rule is to have a high horizontal line when the view is taken, or supposed to be taken, from an eminence; but when the station is on a level, either

actual or assumed, as is the case when a statue or a mountainous landscape is figured, the horizontal line must be low. The horizontal line in nearly all cases is supposed to be level with the spectator's eye. 3. The *vertical line,* which is drawn from the supposed position of the sketcher, perpendicular to the *ground* and *horizontal* lines, meeting the latter in a point which is called the *point of sight,* or center of the picture. The vertical line has no representative in nature, and is merely a mechanical adjunct to the construction of the picture, all vertical lines in nature being parallel to it in the picture. The

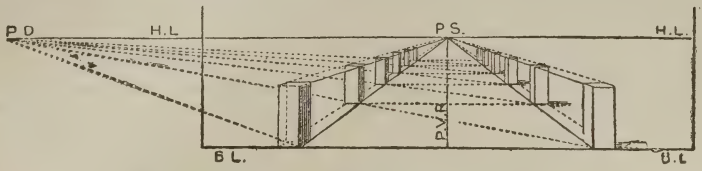


Fig. 1.

Illustrating the more important points and lines ; PVR is the principal visual ray.

point of sight, being the point directly opposite to the observer, is properly placed in the center of the picture, for it is most natural that the view should lie symmetrically on each side of the principal visual line; but this is not by any means a universal rule, for we very frequently find it on the right or left side, but always, of course, on the horizontal line. All lines which in nature are perpendicular to the ground line, or to a vertical plane which is raised upon it as a base, meet in the point of sight, which is thus their *vanishing point* (see the line of the tops and bottoms of the pillars in fig. 1). The *points of distance* are two points in the horizontal line on each side of the point of sight, and in a "direct" sketch are at a distance from it equal to the horizontal distance of the sketcher's eye from the ground line. The equality of distance of these points from the point of sight is not, however, necessary, as it occurs only in those cases where the lines, of which the points of distance are the *vanishing points,* are inclined (in nature) at an angle of 45° to the base line; but, in all cases, the two points of distance are about twice as far apart as the eye is from the picture. One important use of the points of

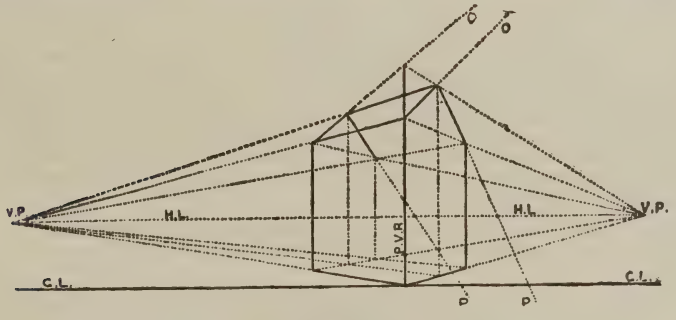


Fig. 2.

The lines O O converge to the accidental point aërial, and P P to the accidental point terrestrial.

distance is to define the distance of objects in a row (fig. 1.) from each other. For this purpose, two points of distance are not necessary, as, when the position of one pillar is found, that of the opposite is at once obtained by drawing a line parallel to the base or ground line. We have seen that the point of sight is the vanishing point of all level lines which meet the ground line or a vertical plane on it at right angles, and that the points of distance (in a *direct* picture) are the vanishing points of all lines which cut the ground line at an angle of 45°; but there are many other groups of parallel lines in a picture which have different situations, and therefore different vanishing points. Such lines with their vanishing points (called, for distinction's sake, *accidental points*) are represented in fig. 2. If the accidental point is above the horizontal line, it is called the *accidental point aërial*—if below, the *accidental point terrestrial;* and a little consideration makes it evident that these points may or may not be situated within the plane of the picture. Such are the points and lines necessary for the construction of a plan in true perspective; and from the above explanation, we may deduce the two general principles: 1. That all parallel straight lines in nature are no longer parallel when projected on the perspective plane, but meet in a point which is called the vanishing point, and is some one of the three above described, unless these lines happen to be also parallel to the ground line or the vertical line, in which case they

remain parallel when transferred to the picture; and 2. That since the bodies drawn below the horizontal line are seen as if from above, those above as if from below, and those to the right and left of the point of sight as if observed from the left and right, it follows, that straight lines which in the picture are above the horizontal line lower themselves, and those below raise themselves to it; those to the left, following the same law, direct themselves to the right, and *vice versâ*.

Aërial perspective, consists in a modulation of the brightness and colors of objects in accordance with the state of the atmosphere, the depth of the body in the perspective plane (i.e., distance in nature from the ground line), and other accidents of place and time. As the distance of objects increases, their illuminated parts are made less brilliant, and their shaded parts more feeble. The bluish tint imparted by a large mass of the atmosphere to the bodies seen through it, is frequently imitated by the mixing of a slight tint of blue with the colors to be applied; a yellow object thus assumes a greenish tint; a red one a violet tint, etc. The air, when charged with vapor, is represented by a diminution of the brightness of colors, and by the grayish tint imparted to them. But in this part of the subject rules are of little avail, for experience alone can guide the painter in faithfully copying the myriad aspects presented by nature.

A thorough knowledge of perspective is a *sine quâ non* to the painter or designer, and though many are inclined to think it a superfluity, and that the sketcher has only to make use of his eyes, and copy justly, the very fact that such is their opinion shows that they have never made the attempt; for it is impossible for the painter, and much more so for the designer, to execute a copy of nature with sufficient accuracy by the sole aid of the eye and hand, a fact that is unfortunately much too frequently proved by many of the sketches exhibited in fine-art collections. Perspective was known to the ancients, but seems to have become extinct during the disturbances that convulsed Italy, and was revived by Albert Dürer, Pietro del Borgo, and Bramantino of Milan (1440), whose body of rules was extended and completed by Peruzzi and Ubaldi about 1600. Dr. Brook Taylor was the first Englishman who discussed the subject scientifically. Works on perspective are now abundant in every language.

PERSPIRATION. See Sweat.

PER STIRPES, a law term of Latin origin (*stirps*, a root), meaning literally "by the stocks" or roots of a race; and used technically as the opposite to *per capita* (q.v.), in the law of succession, to denote descent of property rights not as to individuals but by representation. Thus the descendants or next of kin of A B are said to inherit *per stirpes* when they receive, not equal shares, but such portion as by the laws of descent their immediate ancestor would have been entitled to receive. To illustrate, if A B had five sons, and of these all are alive at the time of his death except C D, who has left three children, and if each of these three children is to receive one-third of the fifth share which would have come to their father if alive, this is succession *per stirpes*. So if all five of A B's sons being dead, the property be divided among the grandchildren so that each group (or the children of each son) receives the same amount. The principle may be applied also to collateral kindred. In most states the statutes provide that if the deceased be intestate and the next of kin stand in degrees of relationship varying in remoteness, the succession shall be *per stirpes*.

PERTH, a co. in s.w. Ontario, watered by the Maitland and Thames rivers, on the Grand Trunk and several other railroads; about 840 sq. m.; pop. '91, 46,307. Co. seat, Stratford.

PERTH, a city, royal, municipal, and parliamentary burgh, and capital of the county of the same name, is situated on the right bank of the Tay, 45 m. n.n.w. of Edinburgh by railway, through Fife. The charming scenery of the immediate vicinity; the Tay, a broad and noble river, sweeping southward along its eastern side; and the superb background of the Grampians on the n., render the site of the "Fair City" exceedingly interesting and beautiful; while its rank, as in some sort the ancient metropolis of Scotland, the important rôle it has played in the history of the country, and the picturesque associations with which history and fiction have invested it, claim for it a high rank among the cities of Scotland. A handsome bridge of nine arches connects the town with the suburb of Bridgend, on the left bank of the river. Further down, the Perth and Dundee railway crosses the river on a fine stone and iron bridge, which also admits foot-passengers. The appearance and salubrity of Perth are much enhanced by two beautiful public parks, called the North and South Inches. The water-supply, obtained from the Tay, is filtered, raised by steam into two elevated reservoirs, and thence distributed over the town, rising to the upper stories of the highest houses. Among the most interesting public buildings are the church of St. John (whence St. Johnstown, or St. John's Town, the old name of the city), an ancient structure in the pointed style, surmounted by a massive square tower; the county buildings, a Grecian edifice; the town-house, part of which is as old as 1210; king James VI.'s hospital; the infirmary; and the local prison. At the head of the South Inch stands the penitentiary, or general prison, one of the largest buildings of the kind in Scotland, where all criminals sentenced to imprisonment for long periods are confined. The town also contains a statue of the late

prince consort; Marshall's monument, erected in honor of a former lord provost, and containing a public library and the museum of the antiquarian society; the public seminaries, Sharp's and other educational institutions. There is a very fine railway station, terminus of both the North British and Caledonian railways. The river is navigable to Perth for vessels of considerable burden. The linen and wincey manufactures are thriving. There are ink, glass, cotton and dye works, iron-foundries, breweries, etc., but shipbuilding has declined. The salmon fishery on the Tay is very valuable. The total quayage of Perth harbor is 1225 ft., and vessels of 200 tons can draw alongside. Perth has a charter as a royal burgh from king William the Lion, 1165–1214. It returns a member to the house of commons. Pop. '96, 30,427. Perth was the scene of a combat between two Highland clans, 1396, described in Scott's *Fair Maid of Perth*, and of Knox's Reformation sermon.

PERTH, a city in s.w. Australia, incorporated 1856; on the n. bank of the Swan river; pop. 8,400. It is the capital of the colony of western Australia, and of the co. of Perth. It is 10 m. n.e. of Freemantle on the Eastern railway, in the vicinity of the Victoria range of mountains, surrounded by picturesque scenery. It is the seat of an Anglican and a Roman Catholic bishopric. The public buildings comprise the government and parliament houses and two cathedrals.

PERTH, The Five Articles of, memorable in the ecclesiastical history of Scotland, were five articles agreed upon in a meeting of the general assembly of the church of Scotland, convened at Perth, by command of James VI., on Aug. 25, 1618. These articles enjoined kneeling at the Lord's-supper, the observance of Christmas, Good Friday, Easter, and Pentecost, and confirmation, and sanctioned the private administration of baptism and of the Lord's-supper. They were highly obnoxious to the Presbyterians of Scotland, not only on their own account, but as part of an attempt to change the whole constitution of the church; and because they were adopted wtihout free discussion in the assembly, and in mere compliance with the will of the king, who was also regarded as having unduly interfered with the constitution of the assembly itself. They were, however, ratified by the parliament on Aug. 4, 1621—a day long remembered in Scotland as "black Saturday"—were enforced by the court of high commission, and became one of the chief subjects of that contention between the king and the people, which produced results so grave and sad for both in the subsequent reign. The general assembly of Glasgow, in 1638, declared that of Perth to have been "unfree, unlawful, and null."

PERTH AMBOY, city and port of entry in Middlesex co., N. J.; on Raritan bay and the Lehigh valley, the Central of New Jersey, the Pennsylvania, and the Staten Island Rapid Transit railroads; 12 miles from New Brunswick, the co. seat. It contains a public library, Old Ministers' home (Presb.), high school, electric light plant, waterworks, state and savings banks, about 10 churches, and manufactories of terra cotta, fine brick, hollow brick, and emery. It is also engaged in shipbuilding, and has large coal-shipping interests. The city was settled in 1680 and named Perth after the earl of Perth, to which the Indian name Ambo was subsequently added. The last British governor of the colony, William Franklin, was captured here in 1776. It was incorporated as a city in 1784. Pop. '90, 9512.

PERTHES, Clemens Theodor, 1809–67, jurist and historian, second son of Friedrich Christoph Perthes (q. v.), was a professor of law at the university of Bonn and the author of a biography of his father (1848–55), treatises on German political history before the Revolution, and in the period of French domination, and *Das Herbergswesen der Handwerksgesellen* (1856).

PERTHES, Friedrich Christoph, an eminent German publisher, distinguished not only in his professional capacity, but for his sincere piety and ardent patriotism, was born at Rudolstadt, April 21, 1772. In his 15th year he was apprenticed to a Leipsic bookseller, with whom he remained six years, devoting much of his leisure time to the acquisition of knowledge. In 1793 he passed into the establishment of Hoffmann, the Hamburg bookseller; and in 1796 started business on his own account; and, by his keen and wide appreciation of the public wants, his untiring diligence, and his honorable reputation, he ultimately made it the most extensive of the kind in modern Germany. During the first few years or so of his Hamburg apprenticeship his more intimate friends had been either Kantian or skeptical in their opinions, and Perthes, who was not distinguished for either learning or speculative talent, had learned to think with his friends; but a friendship which he subsequently formed with F. H. Jacobi (q.v.), and the Holstein poet and humorist, Matthias Claudius, led him into a serious but liberal Christianity. The iron rule of the French in northern Germany, and the prohibition of intercourse with England, nearly ruined trade, yet Perthes, even in this great crisis of affairs, found ways and means to extend his. He endeavored to enlist the intellect of Germany on the side of patriotism, and in 1810 started the *National Museum*, with contributions from Jean Paul Richter, count Stolberg, Claudius, Fouquè, Heeren, Sartorius, Schlegel, Görres, Arndt, and other eminent men. Its success was far beyond Perthes's expectations, and encouraged him to continue his patriotic activity, till Hamburg was formally incorporated with the French empire. He subsequently took a prominent part in forcing the French garrison to evacuate Hamburg, Mar. 12, 1813; and on its reoccupation by the French, he was one of the *ten* Hamburgers who were specially excepted from pardon. After peace had been restored to Europe, Perthes steadily devoted himself to the extension of his

business, and to the consolidation of the sentiment of German national unity, as far as that could be accomplished by literature and speech. In 1822 he removed to Gotha, transferring his Hamburg business to his partner Besser. Here he laid himself out mainly for the publication of great historical and theological works. His subsequent correspondence with literary, political, and theological notabilities—such as Niebuhr (one of his dearest friends), Neander, Schleiermacher, Lücke, Nitszch, Tholuck, Schelling, and Umbreit—is extremely interesting, and throws a rich light upon the recent inner life of Germany. He died May 18, 1843.—See the biography (12th edit. 1853), by his second son, Clemens Theodor Perthes.—The uncle of Friedrich Christoph Perthes was Johann Geor. Justus Perthes, who established a publishing and bookselling house at Gotha in 1785, which has acquired, in the hands of his sons, a great reputation, and from which issues the famous *Almanach de Gotha*. He died in 1816.

PERTHSHIRE, one of the most important counties in Scotland, is bounded on the s. by the shires of Stirling and Clackmannan; on the n. by Inverness and Aberdeen; on the w. by Argyle and Dumbarton; and on the e. by Forfar, Fife, and Kinross. It extends from e. to w. about 70 m., and from n. to s. about 66 miles. Its area is 2,528 m., of which 57,000 acres were wooded. It is divided into the highland and lowland districts, the former occupying much the larger surface, and these are subdivided into ten divisions—viz., Menteith, Strathearn, Gowrie, Stormont, Strathardle, Glenshee, Athol, Breadalbane, Rannoch, and Balquidder. Perthshire, from its insular position and other advantages, has a comparatively mild climate; and the soil, in Strathearn, Carse of Gowrie, and other less extensive tracts, being mostly composed of a rich loam, crops of all kinds are brought to the utmost perfection. These districts are also famed for their fruit and floral productions. Perthshire is not less distinguished for its magnificent mountain, lake, and river scenery. The Grampians here attain to nearly their maximum height, Ben Lawers being within a few feet of 4,000 in altitude; while Ben More is 3,843; and several others above 3,000. The lakes are numerous, the principal of which are lochs Tay, Ericht, Rannoch, Katrine, Achray, Vennacher and Menteith. There are several streams of note, the principal being the Tay, which is fed by numerous other streams, and is said to discharge as much water into the sea as any other river in the kingdom. These lakes and streams afford excellent fishing, and the Tay is valuable for its salmon.

The monuments of antiquity to be found in this county afford an interesting field of investigation for the curious. Lying northward of the Roman wall, Perthshire comprises the scenes of the last struggle for independence which the inhabitants of the lowland districts of Scotland made against those formidable enemies of theirs, who were regarded as invincible. The last battle fought by the Caledonians against the Romans was at Mons Gramp, or rather, as it should be read, Graup, supposed to be indicated by the great camp at Ardoch, between Dunblane and Crieff, and which does not at all seem to be connected with the Grampian range. In this final struggle, the result of which was that the Lowlanders were defeated, Agricola commanded the conquering host, and the Caledonians were led by a chief named *Galgacus*.

The chief towns of Perthshire are Perth, Dunkeld, Auchterarder, Dunblane, and Abernethy. The county is divided into eastern and western parliamentary divisions, each sending one member to the house of commons. According to agricultural statistics taken in 1893, the number of acres under all kinds of crops was 337,000; under corn crops was 55,000; under green crops, 28,000, of which 9,000 were potatoes and 18,000 turnips; grasses—for hay 48,000, not for hay 43,000. Horses, 8,000; cattle, 48,000; sheep, 451,000; pigs, 4,000. The number of acres under cultivation occupied by tenants was in the same year 827,000, and by owners 173,000. On account of the local government act of 1889 the parishes of Culross and Tulliallan, forming a separate part of the county on the firth of Forth, were transferred to the county of Fife.

The old red sandstone, granite, and slate abound. There are volcanic traces in the Sidlaw and Ochil hills, and raised beaches in the firth of Tay prove recent upheaval. In this county are situated some of the stateliest mansions in Scotland, but, except Scone palace, none of them contain any historical memorials; and objects of antiquarian interest more recent than Roman roads and camps are the cathedrals of Dunblane and Dunkeld and the abbey of Culross. Pop. '91, 122,185.

PERTINAX, Publius Helvius, Roman emperor, was b., according to Dio Cassius, at Alba-Pompeia, a Roman colony of Liguria, 126 A.D. He received a good education, and, entering the military service, rose through the various grades till he obtained the command of the first legion, at the head of which he signalized himself in Rhætia and Noricum against the native tribes. In 179 he was chosen consul, aided to repress the revolt of Avitus in Syria, and was governor successively of the provinces of Mœsia, Dacia, and Syria. Being sent by the emperor Commodus to take the command of the turbulent legions in Britain, these troops, against his will, proclaimed him emperor; on which he solicited to be recalled, and was appointed proconsul of Africa, prefect of Rome, and consul (a second time) in 192. On the death of Commodus, his assassins almost forced Pertinax to accept of the purple, which with great hesitation he did; but in spite of his promise of a large donation, he was unable to gain over the prætorian

guard. His accession was, however, hailed with delight by the senate and people, who were rejoiced to have, as ruler, an able captain, instead of a ferocious debauchee; and Pertinax, encouraged by this favorable reception, announced his intention of carrying out an extensive series of reforms, having reference chiefly to the army, in which he hoped to re-establish the ancient Roman discipline. Unfortunately for his reforms and himself, he was attacked by a band of the rebellious prætorians, two months and 27 days after his accession; and disdaining to flee, was slain, and his head carried about the streets of Rome in triumph. From his history, nothing can be gathered respecting his character and talents (except in military affairs); but the respect and esteem in which he was held by the senate and people of Rome argue well in favor of his disposition.

PERTY, Joseph Anton Maximilian; b. in Bavaria, 1804; studied at Munich, and became in 1833 professor of zoölogy and natural history in the university of Bern, and finally rector. D. 1884. His principal works are *Allgemeine Naturgeschichte als philosphische und Humanitätswissenschaft; Die mystischen Erscheinungen der menschlichen Natur; Ueber das Seelenleben der Thier; Blicke in das verborgene Leben des Menschengeistes.*

PERTURBATIONS, in physical astronomy, are the disturbances produced in the simple elliptic motion of one heavily body about another, by the action of a third body, or by the non-sphericity of the principal body. Thus, for instance, were there no bodies in space except the earth and moon, the moon would describe accurately an ellipse about the earth's center as focus, and its radius-vector would pass over equal areas in equal times; but only if both bodies be homogeneous and truly spherical, or have their constituent matter otherwise so arranged that they may attract each other as if each were collected at some definite point of its mass. The oblateness of the earth's figure, therefore, produces pertubations in what would otherwise be the fixed elliptic orbit of the moon. Again, when we consider the sun's action, it is obvious that in no position of the moon can the sun act equally upon both earth and moon; for at new moon, the moon is nearer to the sun than the earth is, and is therefore more attracted (in proportion to its mass) than the earth—that is, the *difference* of the sun's actions on the earth and moon is equivalent to a force tending to draw the moon away from the earth. At full moon, on the other hand, the earth (in proportion to its mass) is more attracted than the moon is by the sun; and the perturbing influence of the sun is again of the nature of a force tending to separate the earth and moon. About the quarters, on the other hand, the sun's attraction (mass for mass) is nearly the same in amount on the earth and moon, but the *direction* of its action is not the same on the two bodies, and it is easy to see that in this case the pertubing force tends to bring the earth and moon nearer to each other. For any given position of the moon, with reference to the earth and sun, the *difference* of the accelerating effects of the sun on the earth and moon is a disturbing force; and it is to this that the pertubations of the moon's orbit, which are the most important, and among the most considerable, in the solar system, are due. [By the word *difference*, just employed, we are of course to understand, not the arithmetical difference, but the resultant of the sun's direct acceleration of the moon, combined with that on the earth reversed in direction and magnitude; as it is only with the *relative* motions of the earth and moon that we are concerned.] This disturbing force may be resolved into three components; for instance, we may have one in the line joining the earth and moon, another parallel to the pane of the ecliptic, and perpendicular to the moon's radius-vector, and a third perpendicular to the plane of the ecliptic. The first component, as we have already seen, tends to separate the earth and moon at new and full, and to bring them closer at the quarters; but during a whole revolution of the moon, the latter tendency is more than neutralized by the former; that is, in consequence of the sun's disturbing force, the moon is virtually less attracted by the earth than it would have been had the sun been absent. The second component mainly tends to accelerate the moon's motion in some parts of its orbit, and to retard it at others. The third component tends, on the whole, to draw the moon towards the plane of the ecliptic. We cannot, of course, enter here into even a complete sketch of the analysis of such a question as this; but we may give one or two very simple considerations which will, at all events, indicate the nature of the grand problem of perturbations.

The method, originally suggested by Newton, which is found on the whole to be the most satisfactory in these investigations, is what is called the *Variation of Parameters*, and admits of very simple explanation. The path which a disturbed body pursues is, of course, no longer an ellipse, nor is it in general either a plane curve or re-entrant. But *it may be considered to be an ellipse which is undergoing slow modifications in form, position, and dimensions, by the agency of the disturbing forces.* In fact, it is obvious that any small arc of the actual orbit is a portion of the elliptic orbit which the body would pursue forever afterwards, if the disturbing forces were suddenly to cease as it moved in that arc. The *parameters*, then, are the elements of the orbit; that is, its major axis, eccentricity, longtitude of apse, longitude of node, inclination to the ecliptic, and epoch; the latter quantity indicating the time at which the body passed through a particular point, as the apse, of its orbit. If these be given, the orbit is completely known, with the body's position in it at any given instant. If there be no disturbing forces, all these quantities are constant; and therefore, when the disturbing forces are taken into account, they change very slowly, as the disturbing forces are in most cases very small. To give an

instance of the nature of their changes, let us roughly consider one or two simple cases. First, to find the nature of some of the effects of a disturbing force acting in the radius-vector, and tending to draw the disturbed, from the central, body. Let S be the focus, P the nearer apse, of the undisturbed elliptic orbit. When the moving body passes the point M, the tendency of the disturbing force is to make it describe the dotted curve in the figure—i. e., the new direction of motion will make with the line MS an angle more nearly equal to a right angle than before; and therefore the apse Q in the disturbed orbit will be sooner arrived at than P would have been in the undisturbed orbit—that is, the apse *regredes*, or revolves in the contrary sense to that of M's motion. Similarly, the effect of M_1 is also to make the apse regrede to Q_1. At M_2 and M_3, on the other hand, the tendency is to make the apse progrede. Also, as the velocity is scarcely altered by such a force, the major axis remains unaltered. Thus at M the eccentricity is diminished, and at M_1 increased, since the apsidal distance is increased at M, and diminished at M_1.

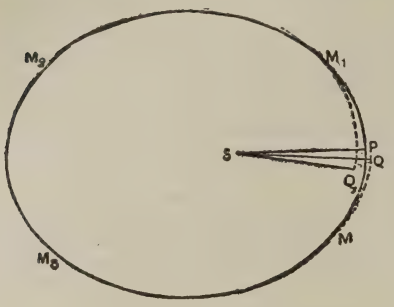


Fig. 1.

Next, consider a tangential accelerating force. Here the immediate effect is to increase the velocity at any point of the orbit, and therefore to make it correspond to a larger orbit, and, consequently, a longer periodic time. Conversely, a retarding force, such as the resistance of a medium, diminishes the velocity at each point, and thus makes the motion correspond to that in an ellipse with a less major axis, and therefore with a diminished periodic time. This singular result, that the periodic time of a body is *diminished* by resistance, is realized in the case of Encke's comet, and this observed effect furnishes one of the most convincing proofs of the existence of a resisting medium in interplanetary space.

Again, the effect of a disturbing force continually directed toward the plane of the ecliptic, is to make the node regrede. Thus, if N'N represent the ecliptic, NM a portion of the orbit, the tendency of the disturbing force at M is to make MQ the new orbit, and therefore N' the node. Thus the node regredes, and the inclination of the orbit to the ecliptic is diminished, when the planet has just passed the ascending node. In the second figure, let M_1 be a position of the planet near the descending node N_1. The effect of the disturbing force is to alter the orbit to MN_1'. Thus, again, the node regredes, but the inclination is increased. If NN' and N_1N_1' in these figures represent the earth's equator, the above rough sketch applies exactly to the case of the moon as disturbed by the oblateness of the earth. The reaction of the moon on the earth gives rise to the precession of the equinoxes (q.v.).

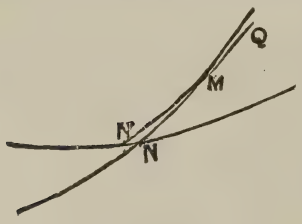


Fig. 2.

By processes of this nature, Newton subjected the variation of the elements of the moon's orbit to calculation, and obtained the complete explanation of some of the most important of the lunar inequalities. See Moon. Others of them—for instance, the rate of progression of the apse—cannot be deduced with any accuracy by these rough investigations, but tax, in some cases, the utmost resources of analysis. Newton's calculation of the rate of the moon's apse was only about half the observed value; and Clairaut was on the point of publishing a pamphlet, in which a new form was suggested for the law of gravitation, in order to account for the deficiency of this estimate; when he found, by carrying his analysis further, that the expression sought is obtainable in the form of a slowly converging series, of which the second term is nearly a large as the first. The error of the modern lunar tables, founded almost entirely on analysis, with the necessary introduction of a few data from observation, rarely amounts to a *second* of arc; and the moon's place is predicted four years beforehand, in the *Nautical Almanac*, with a degree of precision which no mere observer could attain even from one day to the next. This is the true proof, not only of the law of gravitation, but of the laws of motion (q.v.), upon which, of course, the analytical investigation is based.

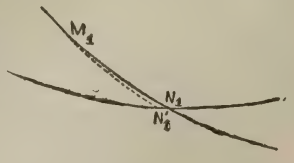


Fig. 3.

With respect to the mutual perturbations of the planets, we may merely mention that they are divisible into two classes, called *periodic* and *secular*. The former depend upon the configurations of the system—such, for instance, is the diminution of the inclination

of the moon's orbit, after passing the ascending node on the earth's equator, already mentioned, or its increase as the moon comes to the descending node. The secular perturbations depend upon the period in which a complete series of such alternations have been gone through, and have, in the case of the planets, complete cycles measured by hundreds of years.

A very curious kind of perturbation is seen in the *indirect* action of the planets on the moon. There is a secular change of the eccentricity of the earth's orbit, due to planetary action, and this brings the sun, on the average, nearer to the earth and moon for a long period of years, then for an equal period takes it further off. One of the effects of the sun's disturbing force being, as we have seen, to diminish, on the whole, the moon's gravity toward the earth, this diminution will vary in the same period as the eccentricity of the earth's orbit; and therefore the moon's mean motion will be alternately accelerated and retarded, each process occupying an immense period.

With special reference to the planetary motions, we may notice that the major axis of each planetary orbit is free from all secular variations; and those affecting the inclination and eccentricity are confined within small limits, and ultimately compensate themselves. These facts, which have been clearly and beautifully demonstrated by Laplace and Lagrange, assure the stability of the planetary orbits, if we neglect the effects of resistance due to the interplanetary matter; which, however, must, in the long run, bring all the bodies of the system into collision with the sun, and finally stop the rotation of the sun itself.

Newton commenced the investigation of perturbations by considering those of the moon; Euler followed with a calculation of Saturn's inequalities; while Clairaut, D'Alembert, and others successively gave those of the other planets.

Every one knows that it was by observing the perturbations of Uranus, and thence discovering the direction of the disturbing force, that Adams and Leverrier were led to their great and simultaneous discovery of the planet Neptune.

PERU', an important maritime republic of South America, bounded on the n. by Ecuador, on the e. by Brazil and Bolivia, on the s. and s.e. by Bolivia and on the w. by the Pacific ocean. Its coast inclines to the s.e. The extreme western point is Parina, long. 81° 20′ w. and the southernmost point of the coast is 71° 20′ w. P. is about 900 miles long and 500 miles in average width. The widest portion is in the extreme northern, and the narrowest in the southern extremity. The estimated area is 464,000 sq. miles. Census-taking is very irregular. There was a census in 1876 which showed a population of over 2,600,000, exclusive of aboriginal Indians, who numbered about 350,000. Later estimates place the population at 3,000,000. On the e. side of the Andes, and between the Amazon and the Purus, there is a wide and unexplored expanse of country, upon which both Peru and Brazil have claims, though the boundary is now generally regarded as marked by the Rio Javary. The country is 1000 m. in length, 780 m. in extreme breadth along the northern boundary, but is, little more than 50 m. wide in the extreme south. Following the general direction, and not including windings, the coast-line is 1600 m. in length. The shores are in general rocky and steep; in the s., lofty cliffs rise from the sea, and, in some places, the water close inshore has a depth of from 70 to 80 fathoms. Further n., however, sandy beaches occur, and in the extreme n., the shores are often low and sandy, covered with brushwood. Owing to the comparative unfrequence of bays and inlets along the coast, the harbors are few and unimportant. Those of Callao (the port of Lima) and Payta afford the most secure anchorage, and the others are Salaverry, Chimbote, Pisco, Mollendo, and Islay. Even there landing by boats is always dangerous, on account of the dreaded surf, occasioned by the swell of the Pacific, which perpetually beats upon the coast; and when goods or passengers require to be landed on unsheltered shores, recourse is had to the primitive *balsas*, or rafts, worked by the natives, and capable of carrying two or three persons.

Islands.—The islands on the Peruvian coast, although valuable, are extremely few in number, and small in extent. In the n., are the Lobos (i.e., *Seal*) islands, forming a group of three, and so called from the seals which frequent them. The largest of them, Lobos de Terra, is 5 m. long by 2 m. broad, and the others, lying 30 m. s.w., are much smaller. On their eastern sides, they are covered with guano, and the quantity on the whole group, when it began to be exported from them, was stated to be 4,000,000 tons. The islands of Macabi and Guañope, near the Lobos, were originally calculated to contain 2,280,000 tons of guano; but the guano exported has very greatly exceeded that amount, and in 1872, it was calculated that there were still 750,000 tons of guano on the former and 500,000 tons on the latter. The Chincha islands, three in number, and the most famous of the whole, which began to supply Europe in 1841, had very little guano left on them in 1873. They are called the North, Middle, and South islands respectively. Each presents, on the eastern side, a wall of precipitous rock, with a general slope towards the western shore. The cavities and inequalities of the surface used to be filled with guano, and this material covered the western slopes to within a few feet of the water's edge. There was no vegetation. The North island has an area of 202 acres. It is formed of felspar and quartz, and is slowly but certainly decreasing in size. This island used to be wholly covered with thick layers of guano, which was quarried in some places to a depth of 80 feet. Hundreds of convicts were employed in cutting the guano and loading the vessels. The Chincha islands ceased to be worked for foreign export in 1872, and now guano is only taken for Peruvian use from the northern island,

where there is still supposed to be 150,000 tons. In 1874, however, valuable new deposits of guano were discovered on the southern coast of Peru, which are estimated to contain about 80,000,000 tons.

The grand physical feature of the country, and the source of all its mineral wealth, is the great mountain system of the Andes. A general description of the formation and character of the Peruvian Andes is given under the article ANDES (q.v.).

Surface, Soil, and Climate.—The surface of Peru is divided into three distinct and well-defined tracts or belts, the climates of which are of every variety from torrid heat to arctic cold, and the productions of which range from the stunted herbage of the high mountain-slopes, to the oranges and citrons, the sugar-canes and cottons, of the luxuriant tropical valleys. These three regions are the *Coast*, the *Sierra*, and the *Montaña.*—The *Coast* is a narrow strip of sandy desert between the base of the western Cordillera and the sea, and extending along the whole length of the country. This tract, varying in breadth from 30 to 60 m., slopes to the shore with an uneven surface, marked by arid ridges from the Cordillera, and with a rapid descent. It is for the most part a barren waste of sand, traversed, however, by numerous valleys of astonishing fertility, most of which are watered by streams, that have their sources high on the slopes of the Cordillera. Many of the streams are dry during the greater part of the year. Between these valleys extend deserts, which are sometimes 90 m. in width. These are perfectly trackless, being covered with a fine, shifting, yellow sand, which is often carried about by the wind in pillars of from 80 to 100 ft. in height. In the coast-region, properly so called, rain is unknown. This is caused by the coast of Peru being within the region of perpetual s.e. trade-winds. These winds, charged with vapors from the Atlantic, strike upon the e. coast of South America, and traverse that continent obliquely, distributing rains over Brazil. But their vapor is thoroughly condensed by the lofty Cordilleras, and their last particles of moisture are exhausted in powdering the summits of these ranges with snow, after which they fall down upon the coast of Peru, cool and dry. The want of rain, however, is compensated for to some extent by abundant and refreshing dews, which fall during the night. The climate of the coast is modified by the cool winds. In the valleys, the heat, though considerable, is not oppressive. The highest temperature observed at Lima in summer is 85°, the lowest in winter is 61° F.

The *Sierra* embraces all the mountainous region between the western base of the maritime Cordillera and the eastern base of the Andes, or the eastern Cordillera. These ranges are, in this country, about 100 m. apart on an average, and have been estimated to cover an area of 200,000 sq.miles. Transverse branches connect the one range with the other, and high plateaux, fertile plains, and deep tropical valleys lie between the lofty outer barriers. The superiority in elevation alternates between the two principal ranges. The e. range, or, as it is generally called, the Andes, has the superiority in height in the southern half of this mountain system. It abuts upon the plain, from the Bolivian frontier, in a majestic mass, surmounted by stupendous pinnacles, rugged in outline, and most frequently rising in splintered needle-like peaks, covered with snow. North of lat. 13° s., however, the western Cordillera assumes the grander character, and preserves it until it crosses the northern frontier. The scenery of the western Cordillera is broader and more massive in character, and its summits less pointed than those of the Andes. Rugged paths, sometimes so narrow as barely to afford footing to the mules which are invariably used in such ascents, lead up its steep sides. Occasionally, from these narrow passes, gaping and apparently bottomless precipices slide perpendicularly downward from the very feet of the traveler, and the prospect is rendered still more hideous by the distant roar of a torrent, hidden by mists, at the bottom of the ravine. Occasionally, also, the mountain route leads over abysses 500 ft. in depth, across which, by way of bridge, a few poles are thrown, which roll about in an uncomfortable manner under the feet. In traversing these dangerous passes, which line the huge rocks like aërial threads, the traveler often comes upon scenery of the most picturesque and beautiful description. The clefts and sides of the hills, even at altitudes which might be called alpine, are clothed with wild-flowers, many of which, long cultivated in the U. S., have become highly prized among us as garden-plants. Verbenas, lupines, blue and scarlet salvias, fuchsias, calceolarias, and the fragrant heliotrope, add a sense of beauty to the sense of power which the stupendous scenery imparts. The following are the most striking and distinctive physical features of the Sierra, beginning from the south: 1. The plain of Titicaca, partly in Peru, and partly in Bolivia, is enclosed between the two main ridges of the Andes, and is said to have an area of 30,000 m.—greater than that of Ireland. In its center is the great lake Titicaca, 12,846 ft. above sea-level, or 1600 ft. above the loftiest mountain pass (the col of Mont Cervin) of Europe. The lake is 115 m. long, from 30 to 60 m. broad, from 70 to 180 ft. deep, and 400 m. in circumference. Its shape is irregular; it contains many islands, and several peninsulas abut upon its waters. 2. The knot of Cuzco. The mountain-chains which girdle the plain of Titicaca trend toward the n.w., and form what is called the knot of Cuzco. The knot comprises 6 minor mountain-chains, and has an area thrice larger than that of Switzerland. Here the valleys enjoy an Indian climate, and are rich in tropical productions; to the n. and e. of the Knot extend luxuriant tropical forests, while the numberless mountain-slopes are covered with waving crops of wheat, barley, and other cereals, and with potatoes; and higher up, extend pasture-lands, where the vicuña and

CENTRAL AMERICA
C A R I B B E A N S E A
NORTH ATLANTIC OCEAN
P A C I F I C O C E A N
WEST INDIA IS.
BARBADOES (Brit.)
TOBAGO
TRINIDAD I. (Brit.)
Port of Spain
Dragons Mouth
Serpents Mouth
Mouths of the Orinoco
VENEZUELA
COLOMBIA
ECUADOR
PERU
BOLIVIA
BRAZIL
BRITISH GUIANA
DUTCH GUIANA
FRENCH GUIANA
GEORGETOWN (Demerara)
PARAMARIBO
CAYENNE
CARACAS
BOGOTA
LIMA
LA PAZ
QUITO
Mouth of the Amazon or Maranon
Rio Negro
R. Amazon
R. Madeira
R. Tapajos
R. Xingu
R. Tocantins
R. Araguay
R. Paraguay
R. Paraná
R. Uruguay
Matto Grosso
Goyaz
Minas Geraes
Pará
Maranhão or San Luis
Ceara or Fortaleza
Parahyba
Pernambuco or Recife
Bahia or San Salvador
Victoria
EQUATOR
GALAPAGOS IS.
CHARLES I.
HOOD I.
CHATHAM I.
INDEFATIGABLE I.
JAMES I.
BINGDON I.
BEMARLE I.
COCOS I.
MALPELO I.
GORGONA I.
CHINCHA IS.
LOBOS DE TIERRA
ROCCAS
FERNANDO NORONHA
MARTIN VAS.
TUMUCURAQUE MTS.
MT. RORAIMA
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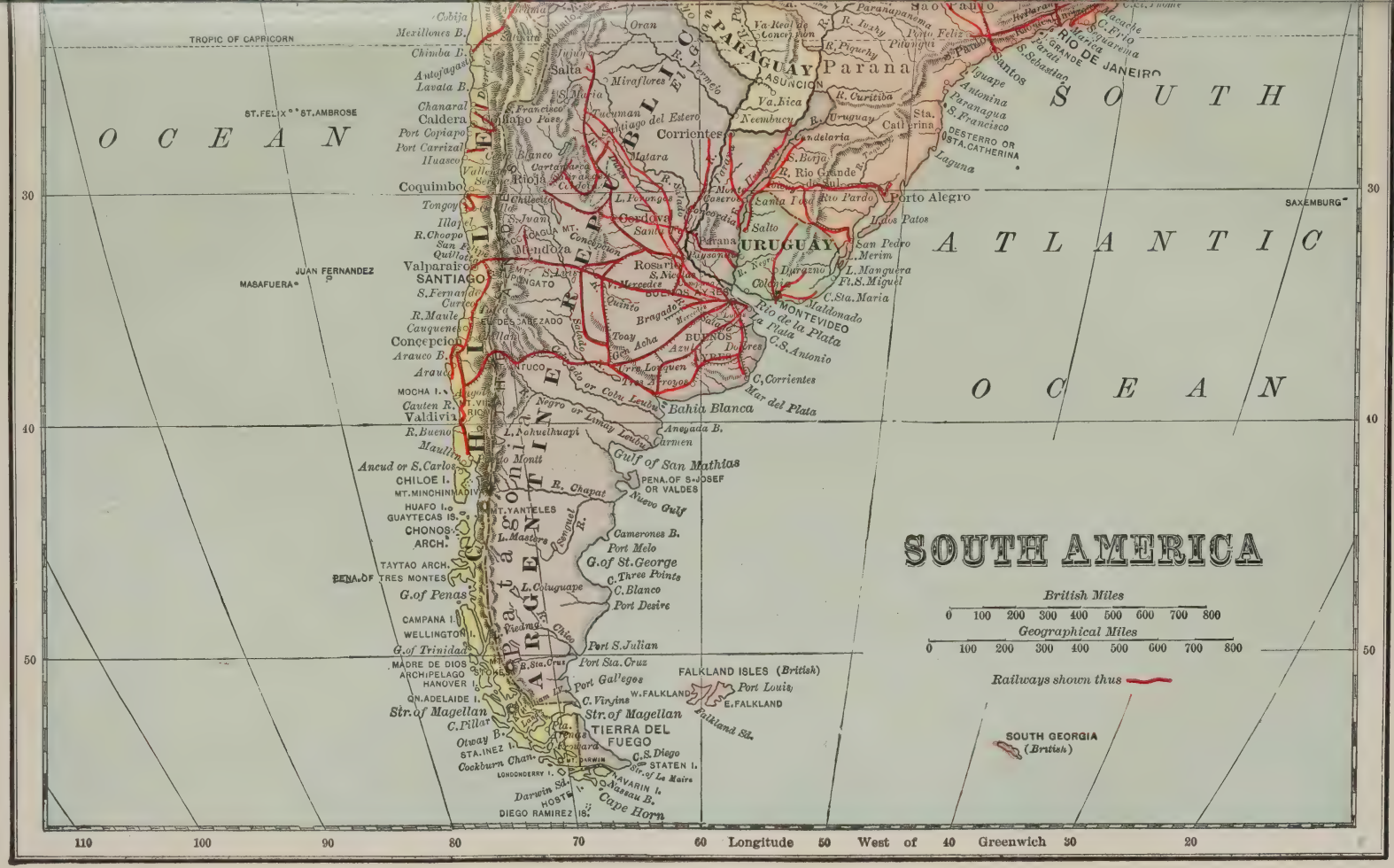
SOUTH AMERICA
British Miles
0 100 200 300 400 500 600 700 800
Geographical Miles
0 100 200 300 400 500 600 700 800
Railways shown thus
OCEAN
ATLANTIC
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SOUTH
TROPIC OF CAPRICORN
ST.FELIX
ST.AMBROSE
JUAN FERNANDEZ
MASAFUERA
SAXEMBURG
ARGENTINE REPUBLIC
PARAGUAY
URUGUAY
Parana
ASUNCION
SANTIAGO
BUENOS AYRES
MONTEVIDEO
Rio de la Plata
Bahia Blanca
Gulf of San Mathias
Mar del Plata
Patagonia
TIERRA DEL FUEGO
Str. of Magellan
Cape Horn
FALKLAND ISLES (British)
Port Louis
W.FALKLAND
E.FALKLAND
Falkland St.
SOUTH GEORGIA (British)
RIO DE JANEIRO
Porto Alegro
Corrientes
Salta
Mendoza
Concepcion
Valparaiso
Coquimbo
Caldera
Valdivia
Chiloe I.
Ancud or S.Carlos
Huafo I.
Chonos Arch.
Taytao Arch.
Pena. of Tres Montes
G.of Penas
Wellington I.
G.of Trinidad
Madre de Dios Archipelago
Hanover I.
Qn.Adelaide I.
Str.of Magellan
C.Pillar
Otway B.
Sta.Inez I.
Cockburn Chan.
Darwin Sd.
Hoste I.
Diego Ramirez Is.
Nassau B.
Navarin I.
Staten I.
C.S.Diego
Str.of Le Maire
Port Desire
Port S.Julian
Port Sta.Cruz
Port Gallegos
C.Virgins
C.Blanco
C.Three Points
G.of St.George
Camerones B.
Port Melo
Nuevo Gulf
Pena.of S.Josef or Valdes
Aneyada B.
Carmen
Bragado
Rosario
Cordova
Tucuman
Miraflores
Matara
Oran
Jujuy
Santa Fe
Rio Pardo
Laguna
Desterro or Sta.Catherina
Santos
S.Sebastian
Antonina
Paranagua
S.Francisco
Iguape
Caravellas
Victoria
Espirito Santo
Mercedes
Colonia
Maldonado
C.Sta.Maria
C.S.Antonio
Durazno
Ft.S.Miguel
L.Manguera
L.Merim
San Pedro
Salto
Uruguay
Parana
Paysandu
Gualeguay
Gualeguaychu
Uruguayana
Cachoeira
Cruz Alta
Passo Fundo
Lages
Curitiba
Paranapanema
Piquery
Ivahy
Pinheiro
Feliz
Pirahy
Mercedes
Sta. Catherina
Candelaria
Rio Grande do Sul
Rio Grande
S.Borja
Ytuzaingo
Corrientes
Neembucu
Va.Rica
Va.Occo
Concepcion
Tongoy
Illapel
Chanaral
Port Copiapo
Port Carrizal
Huasco
Cobija
Mexillones B.
Chimba B.
Antofagasta
Lavata B.
Caldera
Copiapo
Vallenar
Serena
Coquimbo
Ligua
Petorca
Aconcagua
Quillota
Valparaiso
S.Fernando
Curico
R.Maule
Cauquenes
Concepcion
Arauco B.
Arauco
Mocha I.
Cauten R.
Valdivia
R.Bueno
Maullin
Ancud or S.Carlos
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G.of Penas
Campana I.
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Bahia Blanca
Mar del Plata
C.Corrientes
C.S.Antonio
C.Sta.Maria
Maldonado
Montevideo
Rio de la Plata
Colonia
Mercedes
Ft.S.Miguel
L.Manguera
L.Merim
San Pedro
Durazno
Salto
Uruguay
Parana
Paysandu
Gualeguay
Gualeguaychu
Uruguayana
Cachoeira
Cruz Alta
Passo Fundo
Lages
Curitiba
Paranapanema
Piquery
Ivahy
Pinheiro
Feliz
Pirahy
Mercedes
Sta. Catherina
Candelaria
Rio Grande do Sul
Rio Grande
S.Borja
Ytuzaingo
Corrientes
Neembucu
Va.Rica
Va.Occo
Concepcion
Bragado
Rosario
Cordova
Tucuman
Miraflores
Matara
Oran
Jujuy
Santa Fe
Rio Pardo
Laguna
Desterro or Sta.Catherina
Santos
S.Sebastian
Antonina
Paranagua
S.Francisco
Iguape
Caravellas
Victoria
Espirito Santo
Porto Alegro
Lages
Passo Fundo
Cruz Alta
Uruguayana
Gualeguaychu
Gualeguay
Paysandu
Parana
Uruguay
Salto
Rio Negro or Limay Leuvu
Colorado or Coby Leuvu
Quinto
Toay
Acha
Azul
Tapalque
Tres Arroyos
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C.S.Diego
Str.of Le Maire
Cape Horn
Tierra del Fuego
Patagonia
Argentine Republic
Paraguay
Uruguay
Parana
Asuncion
Santiago
Buenos Ayres
Montevideo
Rio de la Plata
Rio de Janeiro
Rio Grande
Porto Alegro
Corrientes
Salta
Mendoza
Concepcion
Valparaiso
Coquimbo
Caldera
Valdivia
Chiloe I.
Ancud or S.Carlos
Huafo I.
Chonos Arch.
Taytao Arch.
Pena.of Tres Montes
G.of Penas
Wellington I.
G.of Trinidad
Madre de Dios Archipelago
Hanover I.
Qn.Adelaide I.
Str.of Magellan
C.Pillar
Otway B.
Sta.Inez I.
Cockburn Chan.
Darwin Sd.
Hoste I.
Diego Ramirez Is.
Nassau B.
Navarin I.
Staten I.
C.S.Diego
Str.of Le Maire
Cape Horn
Tierra del Fuego
Falkland Isles (British)
Port Louis
W.Falkland
E.Falkland
Falkland St.
South Georgia (British)
Ocean
Atlantic
South
110 100 90 80 70 60 Longitude 50 West of 40 Greenwich 30 20
30
40
50

alpaca feed. 3. The valley of the Apurimac, 30 m. in average breadth, and extending n.w. for about 300 miles. This valley is the most populous region of Peru. 4. The Knot of Pasco. From Cuzco proceed two chains toward the n.w.; they unite again in the Knot of Pasco. This Knot contains the table-land of Bombon, 12,300 ft. above sea-level; as well as other table-lands at a height of 14,000 ft., the highest in the Andes; otherwise, however, the physical features of the country resemble those of the vicinity of Cuzco. 5. The vale of the river Marañon. This valley, which is upward of 300 m. in length, is narrow, deep, and nearer the equator than any other valley of the Sierra, and consequently, it is the hottest portion of this region; and its vegetation is thoroughly tropical in character. The conformation of the surface of the Sierra is of the most wonderful description. After the table-lands of Tibet, those of the Peruvian Andes are the highest in the world; but, unlike those of Tibet, which are mere grassy uplands, the table-lands of Peru are the seat of a comparatively high civilization, and are studded over with towns and villages, perched on heights exceeding in elevation the summits of the Jungfrau and the Wetterhorn. Nor are such towns the mere eyries of miners who are tempted to ascend thus high in search of the precious metals; for, even at this elevation, the climate is pleasant, and wheat, maize, barley, rye, and potatoes thrive well. The city of Cuzco, situated in a region of rare beauty, and enjoying a temperate climate, is 11,380 ft. above sea-level, or 2,000 ft. higher than the great St. Bernard. The climate of the Sierra, however, is not always so charming. In general terms, it may be described as mild and variable, with moderate rains. In the district of Paucartambo, rain falls 300 days in the year. A country, however, of such an uneven surface, of snow-covered peaks and tropical valleys, embraces every variety of climate. In all the lower regions of the country the climate is warm, but healthy; in the uplands, and on the highest plateaux, it is often inclement. Violent storms beat upon the plain of Titicaca; and terrific temptests, accompanied with thunder and lightening, roll frequently around the table-lands of Pasco (q.v.); where, indeed, the climate is so cold, that but for the mines, which have attracted hither a numerous population, this region might have remained uninhabited. At the height of 9,000 ft. above sea-level, the mean temperature is 60° Fahr., and the variation throughout the year is not great. The highest peaks of the country reach to upward of 22,000 ft., and many peaks in both ranges are from 17,000 to 20,000 ft. high. In the western Cordillera, and in the s. of the country, are 4 volcanoes—Candarave, Ubinas, Omate, and Arequipa. The soil of the Sierra is of great variety; but wherever it is cultivated, it is productive.

The *Montaña*, forming two-thirds of the entire area of the country, stretches away for hundreds of leagues eastward from the Andes to the confines of Brazil. On the n., it is bounded by the Amazon, on the s. by Bolivia. It consists of vast impenetrable forests and alluvial plains, is rich in all the productions of tropical latitudes, is of inexhaustible fertility, and teems with animal and vegetable life. It is still, however, almost wholly unproductive to man. The silence of its central forests has never been disturbed by the civilized explorer, and its only human inhabitants are a few scattered tribes of Indians. The Montaña is watered by numberless streams, and by a large number of important rivers. It belongs wholly to the basin of the Amazon. Along the head-waters of the Purus, which, flowing through beautiful forest-covered plains, approaches to within 60 m. of Cuzco, there were at one time numerous Spanish farms, where great tracts of forests had been cleared, and where crops of coco, cocoa, sugar, and other tropical productions were regularly raised. These farms have since 1861 been abandoned, and the encroaching forest has already obliterated their sites. The upper waters of the Purus are the head-quarters of a savage and barbarously cruel tribe of wild Indians called Chunchos. These untamable savages have shown the greatest hostility to the advance of civilization. They murdered the settlers, or drove them to take refuge in some less advanced settlement. When Mr. Markham visited this region in 1853, a few farms still existed; from a paper, however, which he communicated to the *Journal of the Royal Geographical Society*, and which is dated 1861, it would appear that the Chunchos had finished their barbarous work, for the settlers had either all been massacred or driven back from the forest, so that now not a single settlement remains. The rich valleys of Paucartambo, once covered with flourishing Spanish farms, have again become one vast tropical forest. The virgin soil of the Montaña is of amazing fertility; while its climate, though not oppressively hot, is healthy. The forests consist of huge trees, of which some are remarkable for the beauty of their wood, others for their valuable gums and resins, and others as timber trees. A rank undergrowth of vegetation covers the country, and the trees are often chained together and festooned with parasites and closely-matted creepers. In this region, for the most part undisturbed by the voice of man, civilized or savage, animal life flourishes in endless variety, and birds of the brighest plumage flit among the foliage. Among the products which are yielded here in spontaneous abundance, are the inestimable Peruvian bark (see CINCHONA), India-rubber, gum-copal, vanilla, indigo, copaiba, balsam, cinnamon, sarsaparilla, ipecacuanha, vegetable wax, etc. On the western fringe of the Montaña, where there are still a few settlements, tobacco, sugar, coffee, cotton, and chocolate, are cultivated with complete success.

Hydrography.—The hydrography of Peru may be said to be divided into three systems—those of lake Titicaca, the Pacific, and the Amazon. The streams that flow into lake Titicaca are few and inconsiderable. The rivers which, having their sources in the western Cordillera, flow w. into the Pacific, are about 60 in number; but many of them are dry in summer, and even the more important are rapid and shallow, have a short

course, are not navigable even for canoes, and are mainly used for the purpose of irrigation. All the great rivers of Peru are tributaries of the Amazon. The Marañon, rising between the eastern and western Cordilleras, and flowing tortuously to the n.n.w., is generally considered to be the head-water of the Amazon (q.v.). The Huallaga rises near the town of Huanuco, and flows northward to the Amazon. It is navigable for 600 m., the head of its navigation (for canoes) being at Tingo Maria, within 100 m. of its source. The Yucayali, or Ucayali, an immense river, enters the Amazon 210 m. below the Huallaga. Its tributaries and upper waters, among which are the Pampas and the Apurimac, drain the greater portion of the Peruvian Sierra. The Purus, which reaches to the valleys of Paucartambo, within 60 m. of Cuzco, has recently been explored. We know several of its sources, and that it enters the Amazon by four mouths, a little above Barra. It flows through what is perhaps the richest and most beautiful region of Peru. Many attempts have been made to explore this river, but none were successful till Mr. Chandless (1865–66) explored it and its tributary, the Aguirey. Sailing down the Rio Negro, from Manoas to the Amazon, he reached the mouth of the Purus, and ascended it a distance of 1866 miles. He found that it flowed in a tortuous course through a rich alluvial plain, and that the few Indians on its upper course were still as primitive as is indicated by the use of only stone hatchets. He ascertained that the Rio Madre de Dios is not the head-water of the Purus. He then ascended the Aguirey, the principal affluent of the Purus, in the hope that it might afford communication with that south Peruvian river, but failed, owing to difficulties insuperable by him, to settle the question.

Productions, Exports, Imports, Revenue, etc.—The wealth and resources of Peru consist, not in manufactures, but entirely in mineral, vegetable, and animal products. The chief products are sugar, cotton, and coffee, of which sugar is the most important. The planting of sugar-cane was introduced from Mexico and the industry soon became extensive. The increasing demand for sugar led to the introduction of slave labor, which began in 1529. At the close of the 18th century there were over 40,000 slaves employed in Peru, but in 1817 the importation was prohibited by the Spanish king. About the middle of the 19th century efforts to encourage immigration were made; and at the same time a large number of coolies were imported from China. This improvement in the labor market led to the rapid extension of the sugar industry and, when followed by the introduction of improved machinery, the exportation greatly increased. For several years after the peace with Chile in 1883, the sugar production declined and the scarcity of labor proved a serious hindrance. In recent years, however, the industry has regained its lost footing, partly through the introduction of better methods of production, and partly through the consolidation of companies leading through the concentration of capital to greater economy in the management. The cultivation of the cane is carried on along the entire coast, between the 3d and 18th degree of latitude. Among the chief departments for sugar production are Lambayeque, Lima, La Libertad, Piura, Ancachs, Ica, Arequipa and Tacna. The chief coffee-growing region is in central Peru. The exports of coffee are valued at 400,000 sols. Considerable attention is devoted to the raising of cocoa, rice, tobacco, and maize. Wines and spirits are manufactured and there is a considerable trade in india-rubber, cinchona, dyes, alpaca, vicuña, and medicinal plants; and there are rich deposits of guano on various islands along the coast. The mineral wealth of Peru is considerable and includes gold, silver, copper, lead, coal, tin, zinc, quicksilver, petroleum, salt, sulphur, and other minerals. Gold is found in many parts of the country, but there has been a lack of enterprise in the working of the mines. In 1895 six of the 19 departments were said to have deposits of gold, and in 1896 there were reports of gold discoveries in the provinces of Sandia and Carabaya. There were in 1894 upwards of 4,100 mines in Peru, and of these 427 were gold mines or washings, and 46 were for gold and silver together. The great majority of the mines, namely 2641, were for silver. There are extensive supplies of petroleum, especially in the province of Paita.

The chief exports of Peru are sugar, cotton, silver and silver ore, and wool. The leading nations with which she trades are Great Britain, Germany, the United States, and the South American republics. For the year ending June 30, 1896, the exports from Peru to the United States amounted to $886,476, and the leading items on the list were skins, cotton, coca leaves, and silver. There are no special taxes on foreigners, who enjoy the same privileges in respect to trade as the natives. The revenue is derived mainly from customs, but there is a direct tax on the rent from real property, and a considerable revenue is derived from the salt monopoly and from railways and telegraphs. The foreign debt of Peru consists of two loans which were obtained from England in 1870 and 1872. They amounted to £31,579,080. They were secured on the guano deposits and the general resources of the country, but the guano deposits became the possession of Chile and no interest was paid on the loans for many years. For a considerable period before the war with Chile, Peru had an inconvertible paper currency, but after that the paper became so far depreciated that only hard money was in circulation. The monetary unit is the sol, which is worth about fifty cents in United States currency. The constitution makes the public exercise of any other religion than the Roman Catholic unlawful, but as a matter of fact, churches of other denominations are tolerated to some extent. Still the number of Protestants, Jews, and those of other religions than the Roman Catholic, is comparatively insignificant. Lima contains the university of San Marcos, the oldest on the American continent, with faculties of political science, law, medicine, theology and applied sciences. Secondary education is controlled

by the government, which maintains high schools in the capitals of the departments. There are schools for special and technical training, and two minor universities at Arequipa and Cuzco. Primary instruction is compulsory. The military and naval forces of the republic are not large, the former consisting in 1896, of about 2875 men, and the latter comprising a single cruiser, one training ship, and some vessels which cannot be classified.

Ancient Civilization and History.—Peru, the origin of whose name is unknown, is now passing through its third historical era, and is manifesting its third phase of civilization. The present era may be said to date from the conquest of the country by the Spaniards in the early part of the 16th c.; the middle era embraces the rule of the Incas; and the earliest era, about which exceedingly little is known, is that pre-Incarial period, of unknown duration, during which a nation or nations living in large cities flourished in the country, and had a civilization, a language, and a religion different, and perhaps in some cases even more advanced than those of the incas who succeeded them, and overran their territories. Whence these pre-incarial nations came, and to what branch of the human family they belonged, still remain unanswered questions. Their existence, however, is clearly attested by the architectural remains, sculptures, carvings, etc., which they have left behind them. Ruins of edifices constructed both before the advent of the incas, and contemporary with, and independently of them, are found everywhere throughout the country. On the shores of lake Titicaca, for example, are the ruins of Tia-Huanacu, consisting of sculptured monolithic doorways, one of which is 10 ft. high, and 13 ft. wide; of pillars, 21 ft. high, placed in lines at regular distances; and of immense masses of hewn stone, some 30 ft. long by 18 broad. In 1846, several colossal idols were excavated, some being 18 ft. long, 18 wide, and 6 thick. The idols are in the form of statues, and the ears are not enlarged by the insertion in the lobes of silver rings, as those of sculptured figures, executed in incarial times invariably are. The ancient fragments of buildings on these shores were beheld with astonishment by the earliest of the incas, who, by their own confession, accepted them as models for their own architecture. The name Tia-Huanacu is comparatively modern, having been conferred by one of the incas; neither history nor tradition has handed down the original name. The ruins stand at a height of 12,930 ft. above sea-level, and one of the many mysteries which have crowded around this ancient site is, that this spot, in the midst of what is now generally a frozen desert, and where the rarity of the air must be so great as to be hurtful, should have been chosen as the seat, as it is generally believed to have been, of an ancient government. Of the character and degree of the civilization of the pre-incarial races, almost nothing is known. It is worthy of note, however, that at Pachacamac, 25 m. s. of Lima, where there are the remains of a now wholly deserted city, and of a great temple, the religion seems to have been a pure Theism; for when the Peruvians of Cuzco carried their victorious arms across the Cordilleras to this district, they beheld this temple (the doors of which are said to have been of gold inlaid with precious stones) with astonishment, not only because it rivaled if not surpassed in splendor the famous temple of the sun at Cuzco, but because it contained no image or visible symbol of a god. It was raised in honor of an invisible and mysterious deity, whom the inhabitants called Pachacamac, the creator of the world (from two words of the ancient Peruvian language, *pacha*, the earth; and *camac*, participle of the verb *camani*, to create). The Peruvians did not dare to destroy this temple, but contented themselves with buildlng by its side a temple of the sun, to the worship of which they gradually won over the inhabitants. For further information regarding Pre-Incarial times and races, see W. Bollaert's *Antiquities, Ethnology, etc., of South America* (Lond. 1860); Markham's *Peru* (1881).

Regarding the origin of the incas, nothing definite can be said. We have no authorities on the subject save the traditions of the Indians, and these, besides being outrageously fabulous in character, are also conflicting. It appears, however, from all the traditions, that Manco, the first inca, first appeared on the shores of lake Titicaca, with his wife Mama Oello. He announced that he and his wife were children of the sun, and were sent by the glorious Inti (the sun) to instruct the simple tribes. He is said to have carried with him a golden wedge, or, as it is sometimes called, a wand. Wherever this wedge, on being struck upon the ground, should sink into the earth, and disappear forever, there it was decreed Manco should build his capital. Marching northward, he came to the plain of Cuzco, where the wedge disappeared. Here he founded the city of Cuzco, became the first inca (a name said to be derived from the Peruvian word for the sun), and founded the Peruvian race, properly so-called. Manco, or Manco Capac (i. e., Manco the ruler), instructed the men in agriculture and the arts, gave them a comparatively pure religion, and a social and national organization; while his wife, Mama Oello, who is also represented as being his sister, taught the women to sew, to spin, and to weave. Thus, the inca was not only ruler of his people, but also the father and the high-priest. The territory held by Manco Capac was small, extending about 90 m. from e. to w., and about 80 m. from n. to south. After introducing laws among his people, and bringing them into regularly organized communities, "he ascended to his father, the sun." The year generally assigned as that of his death, after a reign of 40 years, is 1062 A.D. The progress of the Peruvians was at first so slow as to be almost imperceptible. Gradually, however, by their wise and temperate policy, they won over the neighboring tribes, who readily appreciated the benefits of a powerful and fostering government. Little is clearly ascertained regarding the early history of the Peruvian kingdom, and the lists given of its early sovereigns are by no means to be trusted. They invented no alphabet,

and therefore could keep no written record of their affairs, so that almost all we can know of their early history is derived from the traditions of the people, collected by the early Spaniards. Memoranda were indeed kept by the Peruvians, and, it is said, even full historical records, by means of the *quipu*, a twisted woolen cord, upon which other smaller cords of different colors were tied. Of these cross threads, the color, the length, the number of knots upon them, and the distance of one from another, all had their significance; but after the invasion of the Spaniards, when the whole Peruvian system of government and civilization underwent dislocation, the art of reading the quipus seems either to have been lost, or was effectually concealed. Thus it is that we have no exact knowledge of Peruvian history further back than about one century before the coming of the Spaniards. In 1453 Tupac Inca Yupanqui, the 11th inca, according to the list given by Garcilasso de la Vega, greatly enlarged his already wide-spread dominions. He led his armies southward, crossed into Chili, marched over the terrible desert of Atacama, and penetrating as far s. as the river Maule (lat. 36° s.), fixed there the southern boundary of Peru. Returning, he crossed the Chilian Andes by a pass of unequaled danger and difficulty, and at length regained his capital, which he entered in triumph. While thus engaged, his son, the young Huayna Capac, heir to the fame as well as the throne of his father, had marched northward to the Amazon, crossed that barrier, and conquered the kingdom of Quito. In 1475 Huayna Capac ascended the throne, and under him the empire of the incas attained to its greatest extent, and the height of its glory. His sway extended from the equatorial valleys of the Amazon to the temperate plains of Chili, and from the sandy shores of the Pacific to the marshy sources of the Paraguay. Of this immense territory, Cuzco, as its name implies (the word signifies naval), was the great center; great roads branched off from it to the n., s., e., and w., and ramified through every part of the kingdom. The greatest highway of the country was that which led from Quito through Cuzco into the Chilian dominions. In its construction, galleries were cut for leagues through the living rock; rivers were crossed by bridges of plaited osiers, that swung in the air; precipices were ascended by staircases artificially cut; and valleys were filled up with solid masonry. It was from 1500 to 2,000 m. long, was about 20 ft. broad, and was built of heavy flags of freestone. Upon all the great routes were posts or small buildings, about 5 m. apart, attached to which were a number of runners, whose business it was to carry forward the dispatches of government. By means of these messengers, fresh fish caught on one day at Lurin, on the Pacific, is said to have been eaten the next day at Cuzco. The distance between these places is 300 m., and the road traverses the wildest and most mountainous country in the world. Order and civilization accompanied conquest among the Peruvians, and each tribe that was vanquished found itself under a careful paternal government, which provided for it, and fostered it in every way.

The government of Peru was a pure but a mild despotism. The inca, as the representative of the sun, was the head of the priesthood, and presided at the great religious festivals. He imposed taxes, made laws, and was the source of all dignity and power. He wore a peculiar head-dress, of which the tasseled-fringe, with two feathers placed upright in it, were the proper insignia of royalty. Of the nobility, all those descended by the male line from the founder of the monarchy, shared, in common with the ruling monarch, the sacred name of inca. They wore a peculiar dress, enjoyed special privileges, and lived at court; but none of them could enter the presence of the inca except with bare feet, and bearing a burden on the shoulders, in token of allegiance and homage. They formed, however, the real strength of the empire, and, being superior to the other races in intellectual power, they were the fountain whence flowed that civilization and social organization which gave Peru a position above every other state of South America. Prior to the arrival of the Spaniards, Peru contained a pop. of 30,000,000—twelve times greater than it is at the present day. The empire was divided into four parts, into each of which one of the great roads branched from Cuzco. Each of the four provinces was administered by a viceroy or governor. The nation was further subdivided into departments of 10,000 inhabitants, each also administered by a governor; and there were other subdivisions into various numbers, the lowest of which was 10, and every one of which was ruled by head-men, who were responsible for offenders, and were required to see that those under them enjoyed the rights to which they were entitled. The governors and chief rulers were selected from the inca aristocracy. The laws related almost wholly to criminal matters, and were few, and remarkably severe. Theft, adultery, murder, blasphemy against the sun, and burning of bridges, were all capital crimes. The territory of the empire was divided into three portions, and from these portions were derived the revenue that supported the *sun*, the *inca*, and the *people* respectively. The numerous priesthood, and the costly ceremonial of the national worship, were supported by the first; the royal household and the government expenditure were defrayed out of the second; and the people, at so much per head, divided the third of these portions. There was a new division of the soil every year, and the extent of land apportioned to each householder was regulated by the numbers in his family. It might be supposed that this arrangement would be fatal to improvement of the soil, and to the pride in and love of home; but this was not the case; and it is probable that at each partition of the soil, the tenant was, as a rule, confirmed in his occupation. The three divisions were cultivated by the people, the territory apportioned to the sun being attended to first, that belonging to the people themselves next, and lastly, the division belonging to the inca. The labor on the inca's share of the land was engaged in by the whole population at the same time, and the work was lightened by the national songs

PERU, BRAZIL, ETC.—1. Aymara Bolivia) dance. 2. Coretu. 3. Aymaras. 4. Peruv
(Brazil). 10. Costume of Inca. 11. Toba Indian (Bolivia). 12. Image of gol
mummies. 17, 18. Aymara mummies. 19. Scepter of the Incas. 20, 21. Clubs.
Brazil) speaking-trumpet. 26, 27. Botocudo ear and lip blocks. 28. Botocudo bu

vase. 5. Organ. 6. Mura. 7. Miranha girl. 8. Payaguas (Paraguay). 9. Majaruna
13. Water vessel in the form of a priest. 14. Temple ruins at Titicaca. 15, 16. Quichua
. Knife. 23. Puru hammock. 24. Altar for sacrifices at Huanuco. 25. Botocudo (eastern
t-bow. 29. Peruvian silver idol. 30. Portal of Inca's palace. 31. Vessel.

and ballads, and the scene made picturesque by the holiday attire of the workers. The manufactures of the country were managed in the same way, the people laboring first in making clothes for themselves, and afterwards giving their work to the inca. The mines were worked by the people, but no one gave more than a certain amount of time to the government service (during which time he was maintained at the government expense) and after discharging the stipulated amount of duty he was succeeded by another. Money was unknown among the Peruvians. They were a nation of workers, but they wrought as the members of one family, labor being enforced on all for the benefit of all.

The national policy of the Peruvians had its imperfections and drawbacks, and though capable of unlimited extension, it was not capable of advancement. It was in the last degree conservative, and was of such a nature that the introduction of reform in any vital particular must have overturned the whole constitution. Nevertheless, the wants of the people were few, and these were satisfied. Their labor was not more than they could easily perform, and it was pleasantly diversified with frequent holidays and festivals. They lived contentedly and securely under a government strong enough to protect them; and a sufficiency of the necessaries of life was obtained by every individual. Still, in the valleys of the Cordilleras and on the plain of Cuzco, may be heard numberless songs, in which the Peruvian mourns the happy days of peace, security, and comfort enjoyed by his ancestors. Further, they revered and loved their monarch, and considered it a pleasure to serve him. With subjects of such a temper and inclination, the incas might direct the entire energies of the nation as they chose; and it is thus that they were able to construct those gigantic public works which would have been wonderful even had they been performed with the assistance of European machinery and appliances.

The Peruvian system of agriculture was brought to its highest perfection only by the prodigious labor of several centuries. Not only was the fertile soil cultivated with the utmost care, but the sandy wastes of the coast, unvisited by any rains, and but scantily watered by brooks, were rendered productive by means of an artificial system of irrigation, the most stupendous, perhaps, that the world has ever seen. Water was collected in lakes among the mountains, led down the slopes and through the sands of the coast, apparently doomed to sterility, by canals and subterranean passages constructed on a vast scale, and the ruins of which, to be seen at the present day, attest the industry, ingenuity, and admirable patience of the Peruvians. The aqueducts, which were sometimes between 400 and 500 m. in length, were in some cases tunneled through massive rocks, and carried across rivers and marshes. They were constructed of large slabs of freestone, fitting so closely as to require no cement, and answering perfectly the purpose for which they were intended, for the sandy wastes were converted into productive fields and rich pasture-lands, and the coast teemed with industrious inhabitants. In the valley of Santa, there were once 700,000 inhabitants; there are now only 12,000: in that of Ancullama, there were 30,000 individuals; there are now only 425. The fields on the coast were also enriched with the manure of sea-fowls, which has since come to be known as guano. Fragments of the aqueducts still remain, and are surveyed with astonishment by the traveler, who wonders that such works could have been constructed by a people who appear to have employed no machinery, had no beasts of burden, who did not know the secret of the true arch, and who did not use tools or instruments of iron. But the triumphs of industry were not more decided on the coast than they were in the *Sierra*. Here, at elevations visited now only by the eagle and the condor, the rocky heights, riven by innumerable chasms and deeply-cut precipices, were crowned with waving crops of wheat and maize. Where the mountain-slopes were too steep to admit of cultivation, terraces were cut, soil was accumulated on them, and the level surfaces converted into a species of hanging-gardens. Large flocks of llamas were grazed on the plateaux; while the more hardy vicuñas and alpacas roamed the upper heights in freedom, to be driven together, however, at stated periods, to be shorn or killed. The wool yielded by these animals, and the cotton grown in the plains and valleys, were woven into fabrics equally remarkable for fineness of texture and brilliancy of color.

The character of the architecture of the Peruvians has already been alluded to. The edifices of incarial times are oblong in shape and cyclopean in construction. The materials used were granite, porphyry, and other varieties of stone; but in the more rainless regions, sun-dried bricks were also much used. The walls were most frequently built of stones of irregular size, but cut with such accuracy, and fitting into each other so closely at the sides, that neither knife nor needle can be inserted in the seams. Though the buildings were not, as a rule, more than from 12 to 14 ft. high, they were characterized by simplicity, symmetry, and solidity. The Peruvian architects did not indulge much in external decoration; but the interior of all the great edifices was extremely rich in ornament. In the royal palaces and temples, the most ordinary utensils were of silver and gold; the walls were thickly studded with plates and bosses of the same metals; and exquisite imitations of human and other figures, and also of plants, fashioned with perfect accuracy in gold and silver, were always seen in the houses of the great. Hidden among the metallic foliage, or creeping among the roots, were many brilliantly colored birds, serpents, lizards, etc., made chiefly of precious stones; while in the gardens, interspersed among the natural plants and flowers, were imitations of them in gold and silver, of such truth and beauty as to rival nature. The temple of the sun at Cuzco, called *Corieancha*, or "Place of Gold," was the most magnificent edifice in the empire. On the

western wall, and opposite the eastern portal, was a splendid representation of the sun, the god of the nation. In consisted of a human face in gold, with innumerable golden rays emanating from it in every direction; and when the early beams of the morning sun fell upon this brilliant golden disk, they were reflected from it as from a mirror, and again reflected throughout the whole temple by the numberless plates, cornices, bands, and images of gold, until the temple seemed to glow with a sunshine more intense than that of nature.

The religion of the Peruvians, in the later ages of the empire, was far in advance of that of most barbarous nations. They believed in a Great Spirit, the Creator of the universe, who, being a spirit, could not be represented by any image or symbol, nor be made to dwell in a temple made with hands. They also believed in the existence of the soul hereafter, and in the resurrection of the body. The after-life they considered to be a condition of ease and tranquillity for the good, and of continual wearisome labor, extending over ages, for the wicked. But while they believed in the Creator of the world, they also believed in other deities, who were of some subordinate rank to the Great Spirit. Of these secondary gods, the sun was the chief. They reverenced the sun as the source of their royal dynasty; and everywhere throughout the land, altars smoked with offerings burned in his worship.

About the year 1516, and 10 years before the death of Huayna Capac, the first white man had landed on the western shores of South America; but it was not till the year 1532 that Pizarro (q.v.), at the head of a small band of Spanish adventurers, actually invaded Peru. On his death-bed the great inca expressed a wish that the kingdom of Quito should pass to Atahualpa, one of his sons by a princess of Quito whom he had received among his concubines, and that all his other territories should fall to his son Huascar, the heir to the crown, and who, according to the custom of the incas, should have inherited all its dependencies. Between these two princes, quarrels, resulting in war, arose; and when Pizarro entered Peru he found the country occupied by two rival factions, a circumstance of which he took full advantage. Atahualpa had completely defeated the forces of his brother, had taken Huascar prisoner, and was now stationed at Caxamalca, on the eastern side of the Andes, whither, with a force of 177 men, of whom 27 were cavalry, the dauntless Spanish leader, in Sept., 1532, set out to meet him. For the capture of Atahualpa by the Spaniards, his subsequent life and violent death, see article ATAHUALPA. Shortly after the execution of the inca at Caxamalca, the adventurers set out for Cuzco. Their strength had been recently increased by re-enforcements, and they now numbered nearly 500 men, of whom about a third were cavalry. They entered the Peruvian capital, Nov. 15, 1533, having in the course of their progress toward the city of the incas, had many sharp, and sometimes serious encounters with the Indians, in all of which, however, their armor, artillery, and cavalry gave them the advantage. At Cuzco they obtained a vast amount of gold, the one object for which the conquest of Peru was undertaken. As at Caxamalca, the articles of gold were for the most part melted down into ingots, and divided among the band. Their sudden wealth, however, did many of them little good, as it afforded them the means of gambling, and many of them, rich at night, found themselves again penniless adventurers in the morning. One cavalier having obtained the splendid golden image of the sun as his share of the booty, lost it in play in a single night. After stripping the palaces and temples of their treasures, Pizarro placed Manco, a son of the great Huayana Capac, on the throne of the incas. Leaving a garrison in the capital, he then marched w. to the sea-coast, with the intention of building a town, from which he could the more easily repel invasion from without, and which should be the future capital of the kingdom. Choosing the banks of the river Rimac, he founded, about 6 m. from its mouth, the *Ciudad de los Reyes*, "City of the Kings." Subsequently its name was changed to Lima, the modified form of the name of the river on which it was placed. But the progress of a higher civilization thus begun, was interrupted by an event which overturned the plans of the general, and entailed the severest sufferings on many of his followers. The inca Manco, insulted on every hand, and in the most contemptuous manner, by the proud Castilian soldiers, effected his escape, and headed a formidable rising of the natives. Gathering round Cuzco in immense numbers, the natives laid siege to the city, and set it on fire. An Indian force also invested Xauxa, and another detachment threatened Lima. The siege of Cuzco was maintained for 5 months, after which time the Peruvians were commanded by their inca to retire to their farms, and cultivate the soil, that the country might be saved from famine. The advantages, many, though unimportant, which the inca gained in the course of this siege, were his last triumphs. He afterwards retired to the mountains, where he was massacred by a party of Spaniards. More formidable, however, to Pizarro than any rising of the natives, was the quarrel between himself and Almagro, a soldier of generous disposition, but of fiery temper, who, after Pizarro, held the highest rank among the conquerors. For the insurrection, trial, and execution of this chief, see article ALMAGRO. The condition of the country was now in every sense deplorable. The natives, astonished not more by the appearance of cavalry than by the flash, the sound, and the deadly execution of artillery, had succumbed to forces which they had no means of successfully encountering. Meantime the Almagro faction had not died out with the death of its leader, and they still cherished schemes of vengeance against the Pizarros. It was resolved to assassinate the general as he returned from mass on Sunday, June 26, 1541. Hearing of the conspiracy, but attaching little importance to the information, Pizarro nevertheless deemed it prudent not to go to mass that day.

His house was assaulted by the conspiritors, who, murdering his servants, broke in upon the great leader, overwhelmed him by numbers, and killed him (see PIZARRO). The son of Amalgro then proclaimed himself governor, but was soon defeated in battle, and put to death. In 1542 a council was called at Valladolid, at the instigation of the ecclesiastic Las Casas, who felt shocked and humiliated at the excesses committed on the natives. The result of this council was that a code of laws was framed for Peru, according to one clause of which, the Indians who had been enslaved by the Spaniards were virtually declared free men. It was also enacted that the Indians were not to be forced to labor in unhealthy localities, and that in whatever cases they were desired to work in any particular locality, they were to be fairly paid. These and similar clauses enraged the adventurers. Blasco Nuñez Vela, sent from Spain to enforce the new laws, rendered himself unpopular, and was seized, and thrown into prison. He had come from Spain accompanied by an "audience" of four, who now undertook the government. Gonzalo Pizarro (the last in this country of the family of that name), who had been elected captain-gen. of Peru, now marched threateningly upon Lima. He was too powerful to withstand, and the audience received him in a friendly manner, and after the administration of oaths, elected him governor as well as captain-gen. of the country. The career of this adventurer was cut short by Pedro de la Gasca, who, invested with the powers of the sovereign, arrived from Spain, collected a large army, and pursued Pizarro, who was eventually taken and executed.

A series of petty quarrels, and the tiresome story of the substitution of one ruling functionary for another, make up a great part of the subsequent history. The country became one of the four viceroyalties of Spanish America, and the Spanish authority was fully established and administered by successive viceroys. The province of Quito was separated from Peru in 1718; and in 1788, considerable territories in the s. were detached, and formed into the government of Buenos Ayres. At the outbreak of the war of independence in South America, the Spanish government, besides having much declined in internal strength, was distracted with the dissensions of a regency, and torn by civil war; nevertheless, in 1820, the Spanish viceroy had an army of 23,000 men in Peru, and all the large towns were completely in the hands of Spanish officials. Peru was the last of the Spanish South American possessions to set up the standard of independence. In Aug. 1820, a rebel army, under Gen. San Martin, one of the liberators of Chili, sailed for Peru, and, after a number of successes both on sea and land, in which the patriots were most effectively assisted by English volunteers, the independence of the country was proclaimed July 28, 1821, and San Martin assumed the protectorate of the young republic. From this date to the year 1860, 21 rulers, under various titles, have held sway. For the first 24 years of its existence as an independent republic the country was distracted and devastated by wars and revolutions. In 1845 Don Ramon Castilla was elected president; and under his firm and sagacious guidance the country enjoyed an unwonted measure of peace, and became regularly organized. Commerce began to be developed, and important public works were undertaken. The term of his presidency ended in 1851, in which year Gen. Rufino José Echenique was elected president. The country, however, was discontented, and Castilla again found himself, in 1855, at the head of affairs. Slavery, which, although abolished by the charter of independence, still existed, was put an end to by a decree dated Oct., 1854. In Aug., 1863, a quarrel had taken place at the estate of Talambo, in the north, between some Basque emigrants and the natives, in which several of the disputants were killed or wounded. Taking advantage of this occurrence, the Spanish government sent out a "special commissioner" in the spring of 1864, to complain of injuries sustained by Spaniards. The "commissioner" left Lima on April 12, and on the 14th, a Spanish squadron, under Admiral Pinzon, took forcible possession of the Chincha islands. The European consuls protested loudly against this outrage, and the Peruvians were greatly excited. War was, however, averted, president Pezet being unwilling to risk hostilities with Spain; and, in Jan., 1865, a treaty of peace was signed. This did not lead, however, to internal peace. The president was declared a traitor by the assembly in the same month that saw the treaty of peace ratified in the Spanish capital. Gen. Canesco, after a severe struggle, assumed the presidential authority, and retained it till November, when Col. Prado was nominated temporary dictator. The obnoxious treaty was now rejected, and Peru entered, January, 1866, into a treaty, offensive and defensive, with Chili (q.v.), which country was then at war with Spain; but this led to no serious consequences to Peru, an unsuccessful attack on Callao having vindicated Spanish honor. In October, Gen. Prado was regularly elected president, and, in Feb., 1867, he recommended a new constitution, which was formed and issued in July, when he was again elected president. At the close of 1867 the river Amazon was declared free for navigation to all nations, an event most auspicious for Peru as regards commercial prosperity and national influence. Prado was compelled to resign in 1868, and was succeeded by Col. Balta, who was assassinated in 1872.

The administration of his successor, Don Manuel Prado, was generally excellent, and from 1872 to 1875 the financial condition of the country was improved; and energy was displayed in the organization of a railroad system. But a failure in the product of guano, upon which Peru has chiefly relied for its advancement, brought about business prostration, and the destruction of Peruvian credit abroad; and the construction of public works necessarily ceased. In 1876 Col. Prado was for the second time elected president. Early in 1879 war broke out between Chili and Bolivia. The former country had transferred to the latter certain territory on condition that the Chilians residing therein

should be exempted from taxation, and that special mining and guano privileges should be guaranteed to the Chilians in the district under consideration. In consequence of this guarantee, which was made a part of specific treaty stipulation, a number of Chilian merchants and capitalists organized to develop the resources of the territory in question, and the towns of Antofagasta, Mejillones and Caracolas began to assume considerable importance on account of the investment in their vicinity. But the Bolivian congress having imposed an export duty on the nitrates of the district of Atacama; in direct contravention to the treaty which guaranteed that there should be no augmentation of export duties for twenty-five years; the result was an ultimatum from Chili, which followed this act by taking armed possession of Antofagasta, and the entire district of Atacama. This movement was met by a declaration of war, on the part of Bolivia, in Feb., 1879. A secret treaty existing between Peru and Bolivia brought Peru into the difficulty, notwithstanding the most earnest efforts were made by president Prado and the Peruvian diplomatic representative in Chili to avert such a conclusion. On April 6, war was declared against Peru; and the Chilian army, which had already entered Bolivia, became chiefly engaged in burning the sea-port towns of Peru, and everywhere driving its antagonists before it. Both Chili and Peru possessed navies: and sea-fights occurred without any conclusive result, until the destruction of the Peruvian iron-clad *Huascar* in October, which occurred near Antofagasta, after which Peru remained at a disadvantage. In November the Chilians attacked and routed the Bolivian army, and being in turn attacked by the Peruvians, were equally successful in that engagement, The Peruvian president, Prado, left Peru and went to New York and thence to Europe, when Nicholas de Pierola succeeded him as dictator. The latter put forth every energy to organize a powerful allied army, to oppose the invading Chilian force under gen. Baquedano. But in April, 1880, the latter captured Moquega, and in May, Tacna, two important cities in southern Peru; the allied armies experiencing a defeat at the latter place which was almost a rout. Early in June the same victorious general carried the supposably impregnable stronghold of Arica by storm, thus placing the Chilians in possession of the whole of southern Peru. In the meantime the Chilian fleet was blockading or pillaging the northern Peruvian sea-ports, and Baquedano organized an expedition against Lima. This expedition started in November, by water, and landed at Pisco, about 200 m. s. of Lima. The city of Lurin was first captured; and the Peruvians having made their last stand at Chorillos, a town in the suburbs of the capital, they were dislodged from there, and Lima surrendered on Jan. 17, 1881. After the fall of Lima some desultory fighting was done until a treaty of peace was concluded in the fall of 1883, which was ratified and exchanged some months later. P. ceded to Chili absolutely the province of Tarapaca, and for a term of 10 years the territories of Tacna and Arica ; at the close of this term the people of these territories were to decide by popular vote whether they will return to P. or remain under Chilian rule. Chili agreed to pay the creditors of P. 50 per cent. of the net proceeds from the guano and nitrate of soda trade, until the debt should be paid or the products exhausted; and received an indemnity from P. to pay for the maintenance of an army of occupation stationed in P. previous to the ratification of the treaty. Gen. Miguel Iglesias was recognized as the *de facto* pres. of P. The war left the country in a shattered and bankrupt condition, from which it has not yet recovered. At the present time the constitution of the country is modeled on that of the United States, the executive officer being a president, elected by popular suffrage for four years, and the legislative power being vested in the senate and house of representatives. In 1896 there was a separatist movement under Seminario, for the purpose of securing the independence of the department of Loreto, but it proved unsuccessful. Seminario had been instrumental in bringing president Nicolas de Pierola into power after the overthrow of the dictator Caceres, but, in 1896, Pierola's government showed signs of great weakness, and, besides the separatist movement, there was a formidable conspiracy on foot for his deposition. The two provinces of Tacna and Arica, whose future ownership was to be determined by plebiscite in 1894, were still retained by Chili, but the president's address on the opening of congress, July 28th, declared that Peru would exact from Chili the fulfillment of the promise in regard to these provinces.

PERU, a city in La Salle co., Ill., at the head of navigation, on the n. bank of the Illinois river, here spanned by a handsome bridge; on the Chicago, Rock Island and Pacific railroad; the terminus of the Illinois and Michigan canal; 100 m. s.w. of Chicago. It contains a public square, several public parks, St. Mary's hospital, public library, high school, electric light and street railroad plants, national and state banks, waterworks supplied from artesian well, rolling mills, breweries, and manufactories of zinc, sulphuric acid, clocks, plows, wheels, sash-doors, blinds, brick, and tile. The surrounding scenery is picturesque; the city has large trade by rail and water; and there are valuable bituminous coal mines near by. Pop. '90, 5550. The city is lighted with gas, and has a fire department. It has 4 grain elevators, several churches and public schools.

PERU, city and co. seat of Miami co., Ind.; on the Wabash river and the Wabash and the Lake Erie and Western railroads; 56 miles w.s.w. of Fort Wayne. It contains a public library, Wabash railroad hospital, electric light plant, waterworks supplied from the river with reservoir and direct pressure, national and state banks, shops of the Lake Erie and Western railroad, and manufactories of carbon, woolen goods, furniture, flour, glass, foundry products, baskets, carriages, flax, etc. Pop. '90, 7028.

PERU BALSAM, the product of a tall leguminous tree, *myrospernum peruiferum*, growing in a limited portion of San Salvador, Central America, and cultivated in Cey-

lon. It is a thick, glutinous substance, dark brown in color, has a fragrant balsamic odor, and contains cinnamic and benzoic acid, a resin, and alcohol. It was introduced into Europe about 1527, and was considered valuable for the treatment of bronchial and respiratory diseases, and in local applications for wounds and ulcers. The balsam is obtained by crushing or beating the bark of the trees, and, by a subsequent application of fire causing the bark to fall off in a few days, whereupon the balsam oozes from the trees thus laid bare, and is collected.

PERU'GIA, a province of n. Italy, compartimento of Umbria; 3,748 sq. m.; pop. estimated, Dec. '95, 604,987. Its surface is mountainous, crossed by several ranges of the Apennines, the highest spurs of which appear in the n. and s. portions. It borders on Arezzo, Pesaro ed Urbino, Ancona, Macerata, Ascoli-Piceno, Aquila, Rome, and Siena. It is intersected by the Tiber, and between the mountain ranges, are long, broad, fertile plains. Its soil is remarkably fertile, producing corn, wine, oil, fruit, and silk; honey is among the products, and live-stock is raised. Much attention is paid to the culture of bees, the vine, and tobacco. Marble, lime and building stones are largely exported. Its manufactures are silk goods, pottery, glass, iron-ware etc. It is divided into six districts. Capital, Perugia.

PERU'GIA, a city of central Italy, capital of the province of its own name, stands on a lofty elevation, 800 ft. high, on the right bank of the Tiber, 10 m. e. of the lake of Perugia (ancient *Lacus Trasimenus*), and 84 m. n. of Rome. It is surrounded with walls pierced with numerous gates, of which the *Arch of Augustus* (so called from the inscription *Augusta Perusia* over it, inscribed by Augustus) is the finest. It is the see of a bishop, and contains numerous churches, and many monastic establishments. Its streets are wide, and there are several squares lined with massive buildings. The broad Corso, which contains the finest edifices, unites two squares, one of which is occupied by the Duomo, or cathedral, dedicated to San Lorenzo, and dating from the end of the 15th century. It is in a fine, bold, Gothic style and contains many excellent paintings, carvings, etc. Many of the churches and convents are noble Gothic structures, and all of them are more or less famous for their pictures, some of which are by Raphael, Perugino, and other great masters. In the vicinity of the city, a number of Etruscan tombs, supposed to mark the site of the necropolis of ancient Perugia, have been discovered. The tombs contain numerous beautiful *cinerary urns*, in marble and travertine; and lamps, vases, bronze armor, ornaments, pateræ, etc., were also found, but have for the most part been removed to a neighboring villa. The university of Perugia, founded in 1320 is one of the free universities, and was attended (1894–95) by 306 students. It has various museums, and a library of 60,000 vols., with some valuable manuscripts. Besides the picture-gallery of the academy of fine arts, there are numerous private art-collections. Perugia contains also many interesting palaces, a beautiful fountain, an exchange, theaters, etc. Marble and earthenware, matches, glass and liqueurs, are manufactured; and a considerable trade is carried on in chestnuts, tobacco, oil, wine, and cattle. Pop. (comm.), Dec. '94, 63,400.

Perugia, the ancient *Perusia*, was one of the twelve Etrurian republics. It became tributary to Rome 294 B.C. During the war between Mark Antony and Augustus, it was taken by the latter, and was burned down. It was captured by the Goths under Totila at the fall of the Western Empire. Under pope Paul III., it was united to the papal states. In 1860, it became a part of the kingdom of Italy under Victor Emmanuel.

PERUGIA, Lake of. See Trasimenus Lacus.

PERUGINO, a celebrated Italian painter, whose real name was Pietro Vannucci, was b. at Citta della Pieve in Umbria, about 1446, but having afterwards established himself in the neighboring and more important city of Perugia, where he had the right of citizenship, he is commonly called Il Perugino. It is generally thought that he studied under Andrea Verocchio at Florence. He executed numerous excellent works in various cities, particularly in Florence, Siena, Pavia, Naples, Bologna, Rome, and Perugia. Sixtus IV. employed him in the Sistine chapel; and his fresco of "Christ giving the keys to Peter" is by far the best of those painted on the side-walls of that chapel. He also, along with other contemporary painters, decorated the Stanze of the Vatican; and his works there are the only frescos that were spared when Raphael was commissioned to substitute his works for those formerly painted on the walls and ceilings. The fact of his having had Raphael for his pupil has no doubt, in one way, increased the reputation of Perugino, but it has also in some degree tended to lessen it, as in many of Perugino's best productions, the work of Raphael is confidently pointed out by connoisseurs, and, indeed, many important pictures, at one time acknowledged as his, are now ascribed to his great pupil. His high standing as a painter, however, is established by many admirable works, in which no hand superior to his own could have operated; and, with the exception, perhaps, of Francia, who in some respects is esteemed his equal, he is now acknowledged as the ablest of the masters of that section of the early Italian school in which religious feeling is expressed with great tenderness, in pictures remarkable for delicate execution. Perugino's works are also distinguished by rich and warm coloring. An excellent example of this master's work may be studied in the collection of the national gallery, London—"No. 288. The Virgin Adoring the Infant Christ." Perugino's reputation was high, when the introduction of the cinquecento style, by Leonardo and Michael Angelo, tended to throw into the shade the art of the earlier masters. Disputes ran high between the leaders of the old and new styles, and Michael Angelo is said

to have spoken contemptuously of Perugino's powers. This, of course, has biased Vasari's opinion in his estimate of the opponent of his idol, but Perugino's reputation now stands very high, and his works are greatly esteemed. Raphael was about 12 years of age when he was entered as a pupil with Perugino, who was then (1495) engaged on the frescos in the Sala del Cambia (the Exchange) at Perugia. Perugino died at Castello di Fontignano, near Perugia, in 1523.

PERU'VIAN ARCHITECTURE. Although the buildings of Peru were erected probably about the 12th c. A.D., they possess an extraordinary likeness to those of the Pelasgi in Europe. This resemblance in style must be accidental, arising probably from the circumstance, that both nations used bronze tools, and were unacquainted with iron. The Peruvian walls are built with large polygonal blocks of stone, exactly like what we call "Cyclopean masonry." The jambs of the doorways slope inwards, like those of Etruscan tombs, and have similar lintels. The walls of Cuzco are good examples of this style. It is further remarkable, that these walls are built with re-entering angles, like the fortifications which were adopted in Europe only after the invention of gunpowder.

PERUVIAN BARK. See CINCHONA. An important instance of commercial enterprise, directed to providing relief for human suffering, has been the introduction of cinchonas, or Peruvian-bark trees, into British India. This had long been urged on the East India company by Dr. Royle, but was not undertaken till after his death. The same thing had been attempted a year or two before by the Dutch in Java, on the urgent representations of the botanist Blume, but with very imperfect success, owing to their having procured chiefly plants of a species which produces bark of very inferior quality, and yields little quinine. But Mr. Markham, who was sent to South America by the East India company to procure seeds and plants, was successful in introducing into British India, in the latter part of 1861, a number of the very best species, which were planted chiefly on the Neilgherry hills, and partly also on the mountains of Ceylon and the Himalaya, and from these stations have been diffused throughout the Madras presidency. There are now about 2,700,000 cinchona trees on the government plantations, and the harvest for 1875 amounted to 65,200 lbs., worth about £6,700. The whole yield of the Madras presidency is about double that, 204,000 lbs. having been brought into the London market in 1877–78. Thus an abundant supply of Peruvian bark, and consequently of quinine, has been secured at a moderate price, and yet with profit to the cultivator. In procuring the young trees and seeds which he conveyed to India, Mr. Markham experienced great difficulty from the jealousy of the South American governments, anxious to maintain a rigid monopoly in this precious commodity, and yet taking no effectual means to prevent the rapidly extending waste of the trees in their native forests. Mr. Markham in all his travels saw only one Peruvian-bark tree which had been planted by the hand of man. (See Markham's *Travels in Peru and India*, 1862.)

PERUVIAN GOOSEBERRY. See PHYSALIS.

PE'RUWELS, a t. of Belgium in the province of Hainaut, with bleacheries, lime-kilns, and some linen manufactures. Pop. '90, 8272.

PERUZZI, BALDASSARE DA SIENA, 1481–1536; b. Volterra, Italy, of Sianese parents; son of Antonio Peruzzi. He studied the art of painting at Siena, and began his professional career at Rome. Among his first ambitious efforts were some frescos in the church of Sant Onofrio, in the church of San Rocco a Ripa, and in the fortress of Ostia; evincing remarkable genius, particularly one in chiaroscuro representing a siege by Roman warriors. Assisted by a liberal patron, Agostino Chigi, he studied architecture and ornamented many façades; among them the Farnese palace, the objects on which were mistaken by Titian for real persons; it was adorned with his fresco of the "History of Medusa." He is supposed to be the inventor of the architectural perspective painting perfected by Del Pozzo. In 1520 he succeeded Raphael as the architect of St. Peter's, appointed by Leo X. In 1527, when Rome was pillaged by constable Bourbon, he parted with all his effects and barely escaped with his life. He went to Siena, and his subsequent career, though fulfilling the promise of his youth, brought him little pecuniary reward. His work on the palazzo Massimi he did not live to complete. He was buried near Raphael in the Pantheon. His "Adoration of the Magi" is in the national gallery; also a drawing in chiaroscuro of the "Adoration of the Kings."

PERUZZI, UBALDINO, b. Florence, 1822; graduated at Siena, 1840, and subsequently at the Ecole des Mines in Paris. In 1848 he was sent to Vienna in the interest of the Tuscan government, and was *gonfaloniere* of Florence a short time previous to 1850, in which year he was removed. He was prominent in the overthrow of the Tuscan government, and became a member of the provisional government in April, 1859. Subsequently he went as envoy to Paris, and was deputy from Florence to parliament. In 1860 he was elected a member from Florence to the parliament at Turin, Tuscany having been united to the dominions of Victor Emmanuel. In 1861–62 he was minister of public works appointed by Cavour, and minister of the interior until Sept., 1864, when the Minghetti administration was overthrown. He succeeded Cambray Digny as syndic of Florence. He d. in 1891.

PESA'RO (the ancient *Pisaurum*), a t. of central Italy, in the province of Pesaro ed Urbino, on a rocky wooded hill, at the mouth of the Foglia, — 20 m. n.e. of Urbino. Its streets are broad, and it is surrounded by walls and defended by a citadel. It is a bishop's seat, and contains a cathedral and other churches. The country in the vicinity is fruit-

ful and beautiful. The town was destroyed in the time of Augustus by an earthquake. It was the birthplace of pope Innocent XI. The port, on account of the widening and strengthening of the river banks, is large enough to contain vessels of light draught. Silks, pottery, soap, and leather are manufactured; and an active trade in silk, oil, and hides is carried on. Pop. Dec. '94 (comm.), 25,400.

PESARO-E-URBINO, a province in Italy, bounded on the n. and n.e. by the Adriatic, on the s.e. by the province of Ancona, on the s. by the province of Perugia, and on the w. by Forli and Tuscany; 1118 sq. m.; pop. Dec. '95, 237,658. The surface is mountainous in the w., separated from Tuscany by the Appenines, and drained by the Foglia, Metauro, Cantiano, and Misa.

PESCARA. See AVALOS.

PESCHIE'RA, a fortified place of the first order of the kingdom of Italy, and before 1860 a member of the famous Quadrilateral (q.v.), stands partly on an island in the channel of the Mincio, and partly on the right bank of that river, at its outlet from the lake of Garda. The town itself is a poor place of less than 2,000 inhabitants. Peschiera commands the right bank of the river, and in connection with it is the extensive work called the "Salvi," which covers the approaches of the river in that direction. During the French republican war, Peschiera was a simple pentagon. Its fortifications, however, were greatly strengthened by the Austrians. It is defended by walls and by forts, lunettes, fosses, and a covered way; and the purpose which it is mainly intended to serve, besides that of forming an entrenched camp capable of accommodating a considerable number of troops, is to harass an army attempting to cross the Mincio by Goito or Valeggio. In the island portion of the town are extensive barracks, forming three sides of a square. Peschiera is a station on the Milan and Venice railway, and is also a military port on the lake of Garda. Peschiera was taken by the Piedmontese, under king Charles Albert in 1848, and was again invested by them in June, 1859, after the battle of Solferino. The conclusion of the treaty of Villafranca, however (July 11, 1859), relieved Peschiera fro.n a siege.

PE'SCIA, a t. in Tuscany, Italy, n.w. of Florence, on the Pescia, Lucca, and Pisa railroad; pop. of town 6300. The town is walled.

PESHAW'ER, or PESHAWUR, a municipality of British India, on the n.w. frontier, capital of a province of the same name, 13 m. e. of the eastern extremity of Khyber pass, and 150 m. e.s.e. of Cabul. It is defended by a bastioned wall, and commanded by a fort. The cantonment is very unhealthy. Pop. 84,200.

PESHI'TO, or rather PESHIT'TO (Syr. not, as generally supposed, "simple," "faithful," scil. version, but the "explained," i.e., translated, Bible), is the name given to the authorized Syriac version of the Old, and the greatest part of the New Testament. This version holds among the Syrian Christians the same place as the Vulgate in the Roman, and the "authorized version" in the English church. Many are the traditions about its origin. Thus, the translation of the Old Testament is supposed to date from the time of Solomon and Hiram; or to have been done by Asa, the priest; or, again, that it belongs to the time of the apostl Thaddæus (Adæus), and Abgar, the king of Osrhœne, in the 1st c. after Christ. To the same period is also supposed to belong the translation of the New Testament, which is ascribed to Achæus, a disciple of Thaddæus, the first Edessian bishop and martyr. Recent investigation has not as yet come to any nearer result than to place the latter vaguely in the 2d, and the former in the 3d c., and to make Judaic-Christians the authors of both. Ephræm Syrus (q.v.), who wrote in the 4th c., certainly speaks of the Peshito as *our* version, and finds it already necessary to explain some of its terms, which had become obsolete. Five books of the New Testament (the apocalypse and four of the epistles) are wanting in all the MSS., having probably not yet formed part of the canon when the translation was made. The version of the Old Testament was made direct from the Hebrew, and by men imbued with the Palestinian mode of explanation. It is extremely faithful, and astonishingly free from any of those paraphrastic tendencies which pervade more or less all the Targums or Aramaic versions. Its renderings are mostly very happy, and coincide in many places with those of the Septuagint, a circumstance which has given rise to the erroneous supposition, that the latter itself had been drawn upon. Its use for the Old Testament, is more of an exegetical, for the New Testament, more of a critical, nature. Anything like an edition of the Peshito worthy of its name, is still as much a desideratum as is a critical edition of the Septuagint or the Targums, and consequently investigators have as yet been unable to come to anything but very hazy conclusions respecting some very important questions connected with it. The *editio princeps* of the New Testament part dates Vienna, 1555, that of the Old Testament is contained in the Paris Polyglot of 1645. Several portions of the Peshito have been translated again into Arabic. The Syriac translation of those parts of the New Testament which are not to be found in the Peshito, but are now incorporated into our Syriac Bibles, are of late and uncertain date.

PESSIMISM, roughly speaking, is the doctrine that the pains of life are largely in excess of its pleasures; that life is a burden instead of a privilege; that everything in nature is ordered for or tends to the worst. It is the opposite of optimism (a term of earlier coinage), and although the word is a recent one, and the school of philosophers who have built up a metaphysical system known by this title date from the commencement of the present century, the theory itself is almost as old as the race. In their view

of the emptiness and weariness of this life, considered *per se* the modern pessimists differ little from the writer of the *Book of Job*, or of *Ecclesiastes*, or from the author of *De Contemptu Mundi*, and the whole school of Christian ascetics, though these, unlike the pessimists, believe that the evil of this present world is vastly outweighed by the universal good and the eternal life. In their doctrine that the nearest approach to happiness lies in the annihilation of desire, they differ only in terminology from the Buddhists, who for 2000 years have been aiming at Nirvâna; and even their terminology sometimes reveals a startling likeness. Wertherism in Germany, Renéism in France, Byronism in England—all are forms of Pessimism. Technically speaking, Pessimism originated with Schopenhauer, whose first book was published in 1819, although the term itself, as applied to his teachings, did not make its appearance until about 1865. Schopenhauer's avowed aim was to overthrow the optimistic theories of Liebnitz, to show that this was not only not the best possible world, but the worst. His works were at first neglected, in consequence of the superior popularity of the Hegelian philosophy, which he despised and reviled, but they eventually attracted a large body of disciples. The greatest of these is Hartmann, who, in his *Philosophy of the Unconscious* (1869), holds out the glorious hope that when humanity as a whole has acquired sufficient intelligence to recognize its own misery, it will destroy itself in a last despairing act of cosmic suicide See Optimism.

PESTALOZZI, Johann-Heinrich, was b. at Zürich, Jan. 12, 1745. His family belonged to the middle-class gentry. He was destined for the Christian ministry, but turned aside, however, from this profession, and betook himself to the study of law. To this pursuit he did not long remain constant. The perusal of Rousseau's *Émile*, and the unsatisfactory political condition in which he found Europe, united to disgust him with the artificial life of cities, and he accordingly removed to the country, to devote his life to farming. Purchasing some waste land (after he had acquired the necessary experience), he applied himself successfully to its cultivation, marrying about the same time the daughter of a wealthy merchant. His mind continuing to be afflicted by the contemplation of the unhappy condition of the masses of the people, he devoted himself during the intervals of his work to the consideration of the means best suited to promote their elevation. He was convinced that, by means of a sound education, a remedy might be found for the many evils by which he was surrounded, and by which society was infected. To give effect to his theories he converted his own house into an orphan asylum, and endeavored, by a judicious blending of industrial, intellectual, and moral training, to afford a specimen of sound education, and one so contrived as to be practicable as a national scheme. Meanwhile, the pursuit of his benevolent enterprises involved him, after the lapse of fifteen years (1775–90), in bankruptcy. The failure of his plans, and the democratic tendency of his opinions, brought upon him a good deal of contempt and opposition. His only consolation was having saved from degradation and neglect upward of 100 children, and having issued several volumes on education, containing the results of his experience, and his hopes for the future of the masses. Many subsequent attempts to found schools and to give a specimen of rational scholastic training, were made by Pestalozzi, with varying educational success, but with invariable pecuniary embarrassment. His writings, meanwhile, increased in number and importance. The great idea which lay at the basis of his method of intellectual instruction was, that nothing should be treated of except in a concrete way. *Objects themselves* became in his hands the subject of lessons tending to the development of the observing and reasoning powers—not lessons about objects. In arithmetic, he began with the concrete, and proceeded to the abstract; and into the teaching of writing, he for the first time introduced graduation. His special attention, however, was directed to the moral and religious *training* of children, as distinct from their mere *instruction;* and here, too, graduation, and a regard to the nature and susceptibilities of children, were conspicuous features of his system. Almost all Pestalozzi's methods are now substantially adopted by the instructors of elementary teachers in the normal schools of Europe, and to no man perhaps has primary instruction been so largely indebted. He died in 1827 at Brugg, in the canton of Basel, overwhelmed with mortifications and disappointments.

PESTH, the most populous and important commercial city of Hungary, on the left bank of the Danube, opposite Buda (q.v.), and 130 m. e.s.e. of Vienna. It occupies a low and level site, and contrasts strongly with the antique, picturesque, and rock-built Buda, on the other side of the river. The two cities are connected by a magnificent suspension bridge, erected in 1849, and which spans a water-way of 1245 feet, and also by two passenger bridges and a railway bridge, the latter below the town. The official name of the united cities is, since 1872, compounded of the two, in the form *Budapest*. Along the Pesth side of the river runs a wide quay, paved and terraced, and backed by a handsome row of buildings. The city consists of six divisions—the Inner, Leopold, Theresa, Elisabeth, Joseph, and Francis towns. The inner town, on the bank of the Danube, is the oldest, and the other divisions surround it in the form of a semicircle. Pesth is the seat of the chief judicial courts of Hungary. Its university, founded at Tyrnau, was transferred to Buda in 1780, and thence was removed hither in 1784. It is richly endowed, and in 1894 was attended by upward of 4000 students, while the professors and other teachers numbered 257. Attached to it are a museum, a botanic garden, an observatory, and a library. A handsome new chemical laboratory was opened in 1872, and there is a military academy established in accordance with the provisions of a decree passed in the same year. Of the chief buildings and

institutions the principal are the academy of sciences, founded in 1830; the new buildings (*neugebäude*)—an immense edifice, now used as barracks and as an artillery dépôt; the gymnasium; military school; academy of arts; national museum, with a library of 200,000 volumes, and valuable collections of coins, medals, and antiquities; veterinary school; the national and other theatres; and the society for Slavonic literature. The town contains several important silk-spinning factories, and the principal articles of manufacture are silk, cotton, leather, jewelry, and musical instruments. The grinding of grain into meal and flour are among the most important branches of industry. Four great fairs take place here annually, which draw together a concourse of more than 30,000 strangers, and at which exchanges, amounting in value to upwards of 32,000,000 florins, are made. The trade is chiefly in wines, hides, sugar, tobacco, and brandy. After Vienna, Pesth has the greatest trade of any city on the Danube. Pop. of Budapest, Dec. '90, 506,384.

Pesth is mentioned for the first time in the 12th c.; but although one of the oldest towns in Hungary, its importance dates only from the reigns of Maria Theresa and Joseph II. It was desolated by the Mongols in the 13th c.; and after the battle of Mohacs (q.v.), it fell into the hands of the Turks, who held it till 1686. At the beginning of the 18th c. it was an inconsiderable town, and has only risen into importance within the last 150 years. It has suffered much from inundations of the Danube on several occasions, on one of which, in 1838, 3,000 houses were destroyed. In May, 1849, while Görgei, with an army of 40,000 Hungarians, occupied the heights above Buda, and bombarded the fortress, which was held for the imperial government by gen. Hentzi, the latter gen. retaliated by bombarding Pesth; but on the night of May 20 the Hungarians stormed and took the fortress; and on the following morning raised above its battlements the standard of revolt. On the field of Rákos, in the vicinity, where the great national assemblies of the Magyars used to be held, horse-races, on the English model, now take place annually.

PESTILENCE. The terms plague and pestilence, corresponding to the Greek *loimos* and the Latin *pestis*, have until recent times been used indiscriminately to denote any diseases of an epidemic character which affected large masses of the community, and were remarkable for their fatality, such as the oriental plague, the sweating sickness, cholera, certain virulent forms of fever, etc. "Thus," says Dr. Craigie, in his learned work on *The Practice of Physics* (vol. i. p. 349), "the term *loimos* was applied by the Greeks to designate a species of epidemic remittent fever; and the plague of Athens described by Thucydides is manifestly an epidemic form of the same disease, which has been at all times in the summer season endemial on the coasts and islands of the Mediterranean and Archipelago. The instances of *loimos*, so frequently mentioned by Dionysius of Halicarnassus, and of *pestis*, so often mentioned by Livy and other Roman historians in the early history of Rome, are manifestly the remittent or remittent-continuous fever, which has been at all times the native product of that district, and which acquired, after inundations of the Tiber, or a certain train of weather, the characters of a very generally diffused, a very malignant, and a very mortal distemper. Numerous instances of a similar inaccurate mode of expression occur in designating the remittent fevers of the middle ages and of modern times; and we find, even in the early history of the colonization of the West Indian islands and the United States, frequent examples of the term plague being applied to the remittent fever of these regions, and especially to epidemic attacks of yellow fever." During the middle ages we find the term *pestis* applied to numerous disorders, such as syphilis, small-pox, erysipelas, epidemic sore throat, petecchial fever, the sweating sickness, gangrenous pneumonia, ergotism, etc.

Several Hebrew words are translated *pestilence* or *plague*, in the authorized version of the Old Testament. Some of these pestilences were sent as special judgments, and are beyond the reach of inquiry; others have the characteristics of modern epidemics, in so far as their action was not unnaturally rapid, and they were general in their attacks. Sufficient data are not in our possession to enable us to identify with certainty any of these epidemics. It has been supposed by some critics that in some of these cases (as in Deuteronomy, xxviii. 27; Amos, iv. 10; and Zechariah, xiv. 18; and in the case of Hezekiah) the oriental plague is referred to; but Mr. Poole (Smith's *Dictionary of the Bible*, vol. ii. p. 883) is of opinion that there is not any distinct notice of this disease in the Bible.

PETALUMA, a city in Sonoma co., Cal.; on the Petaluma river and the San Francisco and North Pacific railroad; 42 miles n. of San Francisco, with which it has daily communication by steamers. It is supplied with water from mountain springs, and has street railroads, gas and electric lights, public library, silk, woolen, flour, and planing mills, fruit canneries, Highland park, public plazas, about 12 churches, and several banks. Pop. '90, 3,692.

PETARD, an instrument for blowing open gates, demolishing palisades, etc. It consists of a half-cone of thick iron filled with powder and ball; this is firmly fastened to a plank, and the latter is provided with hooks, to allow of its being attached securely to a gate, etc. The engineers attached the petard, lighted the slow-match by which it was to be fired, and fled. When the explosion took effect a supporting column charged through the breach, while the defenders were yet in consternation. The petard has been almost

universally superseded by the use of powder-bags. Large petards contained as much as 13 lbs. of powder. See illus., CANNON, vol. III.

PETAU, DENYS (better known by the Latinized *Dionysius Petavius*) : 1583–1652 ; b. Orleans, France ; became prof. of philosophy in his 19th year at Bourges ; entered the Society of Jesus, 1605, and afterwards taught rhetoric and theology in the colleges of the order at Reims, La Flèche, and Paris. He published numerous controversial and philosophical works, the chief being a treatise on chronology, *De Doctrina Temporum*, 1627, which with his own abridgment, *Rationarum Temporum*, has been frequently reprinted, and his great, but unfinished, work *De Theologicis Dogmatibus*, 5 vols., 1644–50, which earned for him the title of "Restorer of Dogmatic Theology."

PETCHARY, the popular name of a number of species of the genus *tyrannus*, sometimes ranked with the shrikes (*laniadæ*), and sometimes with the fly-catchers (*muscicapidæ*). The name seems to be derived from the cry of the GRAY PETCHARY (*T. dominicensis*), a bird very common in the warm parts of America and in some of the islands of the West Indies, gregarious and migratory, spending the spring and summer in the islands, and retiring to the hottest parts of the main-land from the end of September to the beginning of January. Its cry is a kind of shriek, consisting of three or four shrill notes, incessantly repeated. The entire length of the gray petchary is about 9½ inches. It is a very bold and strong bird, and in defense of its young will maintain the battle against any hawk. It feeds partly on insects, sometimes on humming-birds, and partly on berries. When fat it is much esteemed for the table, and great numbers are shot on this account.—The COMMON PETCHARY (*T. caudifasciatus*) is one of the most common birds of the West Indies. At certain seasons of the year, when very fat, it is in great request for the table. This bird has been observed to play with a large beetle, as a cat does with a mouse, letting it drop and catching it before it can reach the ground.

PETCHO'RA, a large river in the n. of European Russia, rises on the western slope of the Ural mountains, flows n. through the eastern parts of the governments of Vologda and Archangel, then s.e., and finally sweeping toward the n., and expanding into an estuary 30 m. wide and full of islands, falls into the Arctic ocean, after a course of 983 miles. It is said to be navigable for large river-boats for 700 miles. It is free from ice 175 days in its upper course, and 127 days at Pustozersk.

PETEC'CHIÆ. This term is given to spots of a dusky crimson or purple color, quite flat, with a well-defined margin, and unaffected by pressure, which closely resemble flea-bites. These spots result from a minute extravasation of blood beneath the cuticle. They occur most frequently on the back, at the bend of the elbow, and in the groin. They indicate an altered state of the blood, and are often symptoms of very serious diseases, as of typhus fever, plague, scurvy, etc. They likewise occur in very severe cases of small-pox, measles, and scarlet fever, when their presence must be regarded as indicative of extreme danger.

PETER, SAINT, Apostle, named originally SIMON, was a native of Bethsaida, on the lake of Gennesaret. His father was called Jonas; and the name by which Peter is known in Christian history was given to him by our Lord, who changed his name of origin (Bar-Jona) into *Cephas*, a Syro-Chaldaic word, which means "rock" or stone, and for which *petra*, or, in the masculine form, *petros*, is the Greek equivalent. He was a fisherman by occupation, and, together with his brother Andrew, was actually engaged in this occupation on the sea of Galilee when our Lord called both to be his disciples, promising to "make them fishers of men." For this invitation they had been prepared by the preaching of John the Baptist, and they accepted it without hesitation. For the incidents recorded of Peter's life as a disciple, we must refer to the gospel narrative. These incidents all chiefly evince a warm and impulsive character, even down to the hour of weakness in which he denied his master. It is plain from the gospel narrative that he was regarded by our Lord with special favor and affection, and the events which followed the ascension of our Lord fall in with this inference from that narrative He was the first mover of the election of a new apostle in the room of Judas Iscariot; he was the spokesmen of the rest on the day of Pentecost; he it was who answered to the charges when they were brought before the council; he is the chief actor in the tragic scene of the death of Ananias and Sapphira; he was the first to break down the wall of the prejudice of race by receiving a Gentile convert into the church; he was the first to propound in the council of Jerusalem the question to be discussed as to the obligation of the Mosaic observances. The last incident of Peter's life supplied by the Scripture narrative is his presence in the council of Jerusalem, 49 A.D. Of his subsequent career, our only knowledge is derived from tradition. His special mission was to the Hebrew race, as Paul's to the Gentile; and he is supposed to have preached through Pontus, Galatia, Cappadocia, Asia, and Bithynia, chiefly to those of his own nation dispersed in these countries, all which are named in the address of the first of the two epistles which he has left. Another tradition which, until the 16th c., met general acceptance, reports that he preached at Rome, that he took up his residence there as bishop, and that he there suffered martyrdom. This tradition is the main foundation of the Roman claim to supremacy in the church. It early encountered the opposition of the reformers; its first antagonist being a writer named Velerius, whose work was published in 1520, and

who was followed by Flacius, Salmasius, and, above all, Spanheim. This view has found supporters in Bauer and the Tübingen school; but the main current of scholarship, Protestant as well as Catholic—from Scaliger, Casaubon, Usher, Pearson, Cave, etc., down to Neander, Gieseler, Bertholdt, Olshausen, and others in our own country—has accepted the Roman tradition without hesitation. The time of his going to Rome has also been the subject of much discussion. By some, he is alleged not to have gone to Rome till the year 63, or, at all events, a short time before his martyrdom; others date his first visit as early as 42 or 43, without, however, supposing his residence after this date to have been continuous. In his first epistle, it is implied that at the time of writing it he was at Babylon; and the name Babylon is by many critics held to be employed as a mystic designation of Rome, in accordance with a practice not unusual with the Hebrews and other orientals; but there is nothing to fix very conclusively the date of this epistle. He is held by Roman Catholic writers to have fixed his see at Antioch before his coming to Rome; but of this supposed event also, the date is uncertain. His martyrdom is fixed in, with much probability, the year 66, and is supposed to have been at the same time and place with that of St. Paul. Peter was sentenced to be crucified, and, according to the tradition (preserved by Eusebius from Origen), prayed that he might be crucified with his head downwards, in order that this death might exceed in ignominy that of his divine master.

PETER I., ALEXIEVITCH, Czar of Russia, generally denominated PETER THE GREAT, was the son of the czar Alexei Mikailovitch by his second wife, Natalia Naryskine, and was born at Moscow June 9, 1672. His father, Alexei, died in 1676, leaving the throne to his eldest son, Feodor, Peter's half-brother. This prince, however, died in 1682 without issue, after naming Peter as his successor, to the exclusion of his own full brother, Ivan. This step immediately provoked an insurrection, fomented by the children of the czar Alexei's first marriage, the most prominent among whom was the grand-duchess Sophia, a woman of great ability and energy, but of unbounded ambition. Disdaining the seclusion customary among the females of the royal family, she showed herself to the *Strelitz* (q.v.), excited them to fury by an ingenious story of the assassination of her brother Ivan, and then let them loose on the supporters of Peter's claims. After a carnage of three days, during which more than sixty members of the most noble families of Russia were massacred, she succeeded in obtaining the coronation (July, 1682) of Ivan and Peter as joint rulers, and her own appointment as regent. Up to Peter's coronation his education had been greatly neglected, but after this time he became acquainted with lieut. Franz Timmerman, a native of Strasburg, who gave him lessons in the military art and in mathematics; after which he had the good fortune to fall under the guidance of Lefort (q.v.), a Genevese, who initiated him into the sciences and arts of civilization, and by showing him how much Muscovy was in these respects behind the rest of Europe, influenced the whole of his future career. Lefort also formed a small military company out of the young men of noble family who attended Peter, and caused Peter himself to pass, by regular steps, from the lowest (that of drummer) to the highest grade in it, rendering him all the while amenable to strict discipline. This course of training, in all probability, saved Peter from becoming the mere savage despot, which his brutal and passionate disposition, and indomitable energy inclined him to be; it also protected him from the jealousy of his half sister, the regent Sophia, who, seeing him absorbed in military exercises and other studies, imagined that he had wholly given himself up to amusement. She, however, soon discovered her error, for Peter, contrary to her wishes, married (Feb., 1689), by his mother's advice, Eudoxia Feodorowna, of the family of Lapoukin; and in October of the same year, called upon his sister to resign the government. In the ensuing contest Peter was at first worsted, and compelled to flee for his life; but he was speedily joined by the foreigners in the Russian service, with a Scotchman named Patrick Gordon (q.v.) and the Swiss Lefort at their head; and the Strelitz, who were his antagonist's mainstay, flocking to his standard, she resigned the contest, and was shut up in a convent, whence, till her death, in 1704, she did not cease to annoy him by her intrigues. On Oct. 11, 1689, Peter made his public entry into Moscow, where he was met by Ivan, to whom he gave the nominal supremacy and precedence, reserving the sole exercise of power for himself. Ivan only enjoyed his puppet sovereignty till 1696. Though Peter was all his life under the dominion of ungovernable passions and sensual habits, yet during great part of his reign he was so exclusively engaged in projecting and carrying out his schemes for the regeneration of Russia, that his gross animal nature had little opportunity of displaying itself.

His first care on assuming the government, was to form an army disciplined according to European tactics, in which labor he was greatly aided by the valuable instructions of Gordon and Lefort, both of whom were military men, and had served in some of the best disciplined armies of western Europe. He also labored to create a navy, both armed and mercantile; but at this period Russia presented few facilities for such an attempt, for she was shut out from the Baltic by Sweden and Poland (the former of whom possessed Finland, St. Petersburg (then called Ingria), and the Baltic provinces), and from the Black sea by Turkey, which, extending along the whole of the north coast, had reduced that sea to the rank of an inland lake; leaving only the White sea and the Arctic ocean, with the solitary port of Archangel, available for the Russian navy. Peter thinking the possession of a portion of the Black sea would best supply the required

facilities of accessible sea-board and port, declared war against Turkey, and took (1696) the city of Azof at the mouth of the Don, after a long siege, which the ineffective condition of his newly-disciplined army compelled him to convert into a blockade. Skilled engineers, architects, and artillerymen were now invited from Austria, Venice, Prussia, and Holland; ships were constructed; the army further improved both in arms and discipline; and many of the young nobility ordered to travel in foreign countries, chiefly in Holland and Italy, for the purpose of acquiring such information as might be useful in the modernization and civilization of their country. They were ordered to take special notice of all matters in connection with ship-building and naval equipments. Others were sent to Germany to study the military art. Not quite satisfied with this arrangement, Peter was eager to see for himself the countries for which civilization had done so much, and which had so highly developed the military art, science, trade, and industrial pursuits; so after repressing a revolt of the Strelitz (Feb., 1697), and dispersing them among the various provinces, he intrusted the reins of government to Prince Romonadofski, assisted by a council of three, and left Russia in April, 1697, in the train of an embassy of which Lefort was the head. In the guise of an inferior official of the embassy he visited the three Baltic provinces, Prussia, and Hanover, reaching Amsterdam, where, and subsequently at Saardam, he worked for some time as a common shipwright. His curiosity was excessive; he demanded explanations of everything which he did not understand; and to his practice of ship-building and kindred trades, he added the study of astronomy, natural philosophy, geography, and even anatomy and surgery. On receipt of an invitation from William III., king of England, he visited that country, and for three months, spent partly in London and partly at Deptford, labored to amass all sorts of useful information. When in England he received the honorary degree of D.C.L. from the university of Oxford. He left England in April, 1698, carrying with him English engineers, artificers, surgeons, artisans, artillerymen, etc., to the number of 500, and next visited Vienna, for the purpose of inspecting the emperor of Austria's army, then the best in Europe. He was about to visit Venice also, when the news of a formidable rebellion of the Strelitz recalled him to Russia, which he reached by way of Poland, arriving at Moscow Sept. 4, 1698. Gen. Gordon had already crushed the revolt, but these turbulent soldiers had so enraged Peter against them by their frequent outbreaks, that he ordered the whole of them to be executed, even occasionally assisting in person on the scaffold. A few, however, were pardoned, and sent to settle at Astrakhan. The czarina Eudoxia, who was suspected of complicity in the conspiracy, which had been the work of the old Russian or anti-reform party, was divorced, and shut up in a convent; the czar's own sister, Martha, was likewise compelled to take the veil. To show his gratitude to his faithful adherents, Peter conferred upon the chief of them the order of St. Andrew, now first instituted. He put the press on a proper footing, caused translations of the most celebrated works of foreign authors to be made and published, and established naval and other schools. At this period, the ordinary arithmetic was first introduced for the management of accounts, these having been previously kept by means of balls strung on a wire (the Tartar method). Peter also introduced the mode of raising revenue by taxation of commodities in common use. Trade with foreign countries, which was formerly punished as a capital crime, was now permitted, or rather, in the case of the principal merchants, insisted upon. Many improvements in dress, manners, and etiquette were introduced authoritatively among the public functionaries, and recommended to the people at large. Even the organization of the national church could not escape Peter's reforming zeal.

In 1700, Peter, desirous of gaining possession of Carelia and Ingria, provinces of Sweden, which had formerly belonged to Russia, entered into an alliance with the kings of Poland and Denmark to make a combined attack on Sweden, taking advantage of the tender age of its monarch, Charles XII.; but he was shamefully defeated at Narva; his raw troops being wholly unable to cope with the Swedish veterans. Peter was by no means disheartened, for, taking advantage of the Swedes being employed elsewhere, he quietly appropriated a portion of Ingria, in which he laid the foundation of the new capital, St. Petersburg, May 27, 1703. Great inducements were held out to those who would reside in it, and in a few years it became the Russian commercial dépôt for the Baltic. In the long contest with Sweden, the Russians were almost always defeated, but Peter rather rejoiced at this, as he saw that these reverses were administering to his troops a more lasting and effective discipline than he could have hoped to give them in any other way. He had his revenge at last, in totally routing the Swedish king at Poltava (q.v.), July 8, 1709, and in seizing the whole of the Baltic provinces and a portion of Finland in the following year. His success against Sweden helped much to consolidate his empire, and to render his subjects more favorably disposed towards the new order of things. After re-organizing his army, he prepared for strife with the Turks, who, at the instigation of Charles XII. (then residing at Bender), had declared war against him. See OTTOMAN EMPIRE. In this contest Peter was reduced to such straits that he despaired of escape, and, looking forward to death or captivity, wrote a letter to his chief nobles, cautioning them against obeying any orders he might give them while a captive, and advising them regarding a successor to the throne in case of his death. But the finesse and ability of his mistress, Catharine, afterwards his wife and successor (see CATHARINE I.), extricated him from his difficulties; and a treaty was con-

cluded (July 23, 1711) by which Peter lost only his previous conquest—the port of Azof and the territory belonging to it. Shut out from the Black Sea, the possession of a good sea-board on the Baltic became the more necessary to him, and the war against Sweden in Pomerania was accordingly pushed on with the utmost vigor. On March 2, 1712, his marriage with his mistress, Catharine, was celebrated at St. Petersburg; and two months afterwards the offices of the central government were transferred to the new capital. His arms in Pomerania and Finland were crowned with success, and in 1713 the latter province was completely subdued. Peter neglected nothing to develop the naval power of the empire, and the strictness with which he enforced the discharge of their duties on his ministers and officers, appears from the refusal, by the court of admiralty, of the czar's own application for the grade of vice-admiral, until by defeating the Swedish fleet at Hangoend, and taking the Aland isles, and several coast-forts in Finland, he had merited the honor. In the end of 1716, and beginning of 1717, in company with the czarina, he made another tour of Europe, this time visiting Paris, where he was received with great empressement, and returned to Russia in Oct., 1717, carrying with him books, paintings, statutes, etc., to a large amount. It was soon after this time that he ordered his son Alexei (q.v.) to be executed, and many of the nobles who had been implicated in his treasonable plans were punished with savage barbarity. In 1721 peace was made with Sweden, and on condition of that power giving up the Baltic provinces, Ingria (now government of St. Petersburg), Viborg, and Kexholm, and a small portion of Finland, with all the islands along the coast from Courland to Viborg, she received back the rest of Finland, with a sum of $2,000,000. In 1722 Peter commenced a war with Persia, in order to open up the Caspian Sea to Russian commerce (see Persia). The internal troubles of Persia compelled the shah to yield to the demands of his formidable opponent, and to hand over the three Caspian provinces along with the towns of Derbend and Baku. On Peter's return to his capital, he inquired into the conduct of his finance ministers, and punished with fines, imprisonment, and even death, those whom he detected in fraudulent acts. To save the empire which he had established and constituted from being abandoned to the weak government of a minor, he, in Feb., 1722, promulgated his celebrated law of succession (see Peter II.). For the last years of his life he was chiefly engaged in beautifying and improving his new capital, and carrying out plans for the more general diffusion of knowledge and education among his subjects. In the autumn of 1724 he was seized with a serious illness, the result of his imprudence and now habitual excesses; and after enduring much agony, he expired, Feb. 8, 1725, in the arms of the empress. See Waliszewski, *Peter the Great* (1897).

PETER II., ALEXEIVITCH, Czar of Russia, was the sole male representative of Peter the Great, being the son of the unfortunate Alexei (see Peter I.) by his wife the princess Charlotte of Brunswick-Wolfenbuttel, and was born Oct. 23, 1715, at St. Petersburg. On the death of the czarina Catharine I., he ascended the throne, May 17, 1727, in accordance with a decree of Peter the Great, which enjoined that each czar should name his successor; and the ambitious Menchikoff, who hoped to govern more easily in the name of a minor, prompted the empress to choose Peter. In order to secure himself in his high position, Menchikoff affianced one of his daughters to the youthful czar, and compelled his relative, Anna Petrowna, and her husband, the duke of Holstein, to retire to their own estates. But, notwithstanding these and other precautions, his power was overturned by a mere child, a playfellow of the boy-ruler, who was of the powerful family of Dolgorouki. Instigated by his friends, this boy, Ivan Dolgorouki, opened the eyes of his sovereign to the humiliating dependence in which he was held by Menchikoff, and inspired him with a strong desire to free himself. The plan succeeded, and the minister and his family were exiled to Siberia, the Dolgorouki family taking their place as favorites. The marriage of a lady of this family with Peter had been arranged, and was almost on the point of being celebrated, when he was seized with small-pox, and died at St. Petersburg, Jan. 29, 1730. During his reign the three Caspian provinces, Asterabad, Ghilan, and Mazanderan, which had been seized by Peter the Great, were recovered by Persia.

PETER III., FEODOROVITCH, Czar of Russia, grandson of Peter the Great (being the son of his eldest daughter Anna Petrowna, wife of Karl Friedrich, duke of Holstein-Gottorp), was born at Kiel, Mar. 4, 1728, and on Nov. 18, 1742, was declared by the czarina Elizabeth (q.v.), her successor on the throne of Russia. From the time of his being publicly proclaimed heir, he lived at the Russian court; and, in obedience to the wishes of the czarina, married Sophia-Augusta, a princess of Anhalt-Zerbst, who, on entering the Greek church (a necessary condition of marriage of a foreigner with the czar present or presumptive), assumed the name of Catharina Alexiowna. Peter succeeded Elizabeth on her death, June 5, 1762; and his first act of authority was to withdraw from the confederate league of France, Austria, and Russia against Prussia, restoring to the heroic monarch of the latter kingdom, Frederic II., the provinces of Prussia Proper, which had been conquered during the seven years' war, and sending to his aid a force of 15,000 men; a line of conduct which seems to have been prompted solely by his admiration for the Prussian sovereign. He also recalled many of the political exiles from Siberia, among whom were L'Estocq, Munnich, and the duke of Courland; abolished the sanguinary law which proscribed any one who should utter a word against the

Greek church, the czar, or the government; and then attempted the realization of his favorite project, which was to recover from Denmark that portion of Slesvig which had been ceded to her in 1713, and to avenge the tyranny and annoyances to which his family —that of Holstein-Gottorp—had been subjected But before the army he had dispatched could reach its destination, a formidable conspiracy, headed by his wife, and supported by the principal nobles, had broken out against him. This conspiracy originated in the general discontent which was felt at the czar's conduct and government, for the nobility were offended at his liberal innovations, and the preference he showed for Germans; the people and clergy, at his indifference to the national religion, and his ill-concealed contempt for Russian manners and customs; while the whole nation murmured at his servility to Frederic II. of Prussia. His wife had still deeper cause for dislike; for though he was himself addicted to drunkenness and debauchery, he never ceased to reproach her with her infidelities, and had even planned to divorce her, disinherit her son Paul (q.v.), and elevate his mistress Elizabeth Woronzof to the conjugal throne. The revolution broke out on the night of July 8, 1762; Peter was declared to have forfeited his crown, and his wife Catharine was proclaimed czarina as Catharine II. (q.v.) by the guards, the clergy, and the nobility. Peter who was then at Oranienbaum, neglecting the counsels of field-marshal Munnich, who proposed to march at once on the capital at the head of the regiments which were still faithful, or at any rate to take secure possession of Cronstadt and the fleet, soon found even the opportunity of flight cut off, and was compelled to submit. He abdicated the crown on July 10, and on the 17th of the same month was put to death by Orloff (q.v.), to secure the safety of the conspirators.

PETER (Don Pedro) **THE CRUEL**, King of Castile and Leon, was the son of Alfonzo XI. and Maria of Portugal, and was born at Burgos, Aug. 30, 1334. On his father's death (1350), Peter succeeded to the throne without opposition, but left the whole exercise of power to his mother, Donna Maria, and Albuerque, his father's prime minister and chancellor. But by the instigation of his mistress (afterward his queen), Marie de Padilla, Peter emancipated himself (1353) from the guidance of the queen-mother and her coadjutor Albuerque, taking the reins of government in his own hands. His rule being much more impartial than that of the regency, obtained exceeding popularity, which was increased by his affable manner towards the mass of his subjects; but the strict justice with which he decided all causes between the rich and poor, the clergy and the laity, combined with a haughty and imperious carriage toward them, alienated from him the nobles and clergy. The plottings of Albuerque, who had fled to Portugal, having culminated (1354) in an outbreak in the province of Estremadura, Peter marched against the rebels, but was betrayed by his brother, Henry of Trastamare, and taken prisoner (Dec., 1354). Popular opinion now declared loudly in his favor; and having escaped from prison, he found himself speedily at the head of a powerful army, with which, despite the excommunication of the pope, he speedily reduced his opponents to submission. But this episode in his career had a disastrous influence on his character for the rest of his life. Betrayed by his relatives, and even by his mother, he became suspicious of every one; and having experienced to the full the power of his enemies, he scrupled not as to the weapons to be employed against them. The rest of his reign was devoted to the destruction of the power of the great vassals, the establishment of his own authority on the ruins of their feudal tyranny, and long-continued and bloody wars with the kingdoms of Aragon and Granada. As the people, however, were in general well and justly governed, it is not improbable that he might have retained his throne in spite of his numerous enemies, had not the heavy taxes which were imposed to maintain the cost of his long wars with Aragon and Granada dissipated his popularity. Henry, who had fled to France, now seizing the favorable opportunity, returned (1366) at the head of a body of exiles, backed by Bertrand du Guesclin (q.v.) with an army of mercenaries, and aided by Aragon, France, and the pope. Peter, however, by promising to England the seaboard of Biscay, with the provinces of Guipuzcoa and Logrono, and supplying a contribution of 56,000 florins, prevailed upon Edward the Black Prince to espouse his cause. Edward invaded Castile in the spring of 1367, totally defeated Henry aud Du Guesclin at Navarette (April), taking the latter prisoner (releasing him almost immediately after), and speedily restoring Peter to the throne. But the king disgusted his chivalrous ally by his cruelty to the vanquished, and paid no heed to his remonstrances; Edward accordingly repassed the Pyrenees, and left the misguided monarch to his fate. The whole kingdom groaned under his cruelties; rebellions broke out everywhere; and, in autumn 1367, Henry returned with 400 lances, the people immediately flocking to his standard. Peter's scanty and ill-disciplined forces were routed at Montiel (Mar. 14, 1369), and himself compelled to retire for safety within the town, whence he was treacherously decoyed and captured by Du Guesclin. He was carried to a tent, where a single combat took place between him and Henry, in which the latter would have been slain, had not some of his followers come to his aid, and slain the unfortunate Peter, Mar. 23, 1369.

PETER THE HERMIT, the first mover of the great mediæval drama of the Crusades (q.v.), was of gentle birth, and a native of Amiens, where he was born about the middle of the 11th century. Having been educated at Paris, and afterward in Italy, he became a soldier. After serving in Flanders without much distinction, he retired from the

army, married, and had several children; but on the death of his wife he became a monk, and ultimately a hermit. In the course of a pilgrimage to the holy land about 1093, he was moved by observing that the holy sepulcher was in the hands of the infidel, as well as by the oppressed condition of the Christian residents or pilgrims under the Moslem rule; and on his return, spoke so earnestly on the subject to pope Urban II., that that pontiff warmly adopted his views, and commissioned him to preach throughout the west an armed confederation of Christians for the deliverance of the holy city. Mean in figure, and diminutive in stature, his enthusiasm lent him a power which no external advantages of form could have commanded. "He traversed Italy," writes the historian of Latin Christianity, "crossed the Alps, from province to province, from city to city. He rode on a mule, with a crucifix in his hand, his head and feet bare; his dress was a long robe, girt with a cord, and a hermit's cloak of the coarsest stuff. He preached in the pulpits, on the roads, in the market-places. His eloquence was that which stirs the heart of the people, for it came from his own—brief, figurative, full of bold apostrophes; it was mingled with his own tears, with his own groans; he beat his breast: the contagion spread throughout his audience. His preaching appealed to every passion—to valor and shame, to indignation and pity, to the pride of the warrior, to the compassion of the man, the religion of the Christian, to the love of the brethren, to the hatred of the unbeliever aggravated by his insulting tyranny, to reverence for the Redeemer and the saints, to the desire of expiating sin, to the hope of eternal life." The results are well known, as among those moral marvels of enthusiasm of which history presents occasional examples. All France, especially, was stirred from its very depths; and just at the time when the enthusiasm of that country had been already kindled to its full fervor, it received a sacredness and an authority from the decree of a council held at Clermont, in which Urban himself was present, and in which his celebrated harangue was but the signal for the outpouring, through all western christendom, of the same chivalrous emotions by which France had been borne away under the rude eloquence of the hermit. For the details of the expedition we must refer to the article CRUSADES, our sole present concern being with the personal history of Peter. Of the enormous but undisciplined army which assembled from all parts of Europe, one portion was committed to his conduct, the other being under the command of a far more skillful leader, Walter the Pennyless. Peter placed himself at their head, mounted upon his ass, with his coarse woolen mantle and his rude sandals. On the march through Hungary, they became involved in hostilities with the Hungarians, and suffered a severe defeat at Semlin, whence they proceeded with much difficulty to Constantinople. There the emperor Alexis, filled with dismay at the want of discipline which they exhibited, was but too happy to give them supplies for their onward march; and near Nice they encountered the army of the sultan Solyman, from whom they suffered a terrible defeat. Peter accompanied the subsequent expedition under Godfrey, but worn out by the delays and difficulties of the siege of Antioch, he was about to withdraw from the expedition, and was only retained in it by the influence of the other leaders, who foresaw the worst results from his departure. Accordingly, he had a share, although not marked by any signal distinction, in the siege and capture of the holy city in 1099, and the closing incident of his history as a crusader was an address to the victorious army delivered on the mount of Olives. He returned to Europe and founded a monastery at Huy, in the diocese of Liege. In this monastery he died, July 7, 1115.

PETER CLAVER, 1582–1654; b. in Catalonia. He joined the Jesuits at Tarragona in 1602, and in 1610 went to Cartagena, the center of the African slave-trade. He was soon afterward ordained priest, and from that time devoted himself to the care and instruction of the slaves on their arrival from Africa. To gain consent of the authorities for access to the slaves, he signed himself the "slave of the negroes forever," and thenceforth lived among them on shipboard and in the hospitals, especially the leprosy-hospitals, ministering to their wants, and eating only the refuse of their food. A body of catechists that he organized, aided him in the instruction of the slaves. His exertions during the plague in Cartagena resulted in utter exhaustion and paralysis. He was beatified by Pius IX. in 1853. His life was written in Spanish and French.

PETERBORO', a co. in central Ontario, Canada, drained by the Obanobee river, traversed by the Midland railroad; about 2500 sq. m.; pop. '91, 37,727. Co. seat, Peterboro'.

PETERBORO', town and co. seat of Peterboro' co., Ontario, Canada; on both sides of the Otonabe river; 76 miles n.e. of Toronto; connected by a handsome bridge with the village of Ashburnham opposite, and on the Canadian Pacific and the Grand Trunk railroads; pop. '91, 9717. The town is lighted with gas, has good water power, and manufactories of leather, engines, farming tools, wooden ware, and woolens. It has a large export trade in grain, pork, and lumber.

PETERBOROUGH, an episcopal city, parliamentary borough and since 1871, a municipal borough of Northamptonshire, stands on the left bank of the Nen — which is thus far navigable for boats — 37 m. n.e. of Northampton, and 76 m. n.n.w. of London by railway. The Great Northern, the London and Northwestern; the Great Eastern and the Midland railways pass the city, and have stations here. Peterborough is regularly laid out, has an excellent grammar-school with an endowment, a corn-exchange

in the Italian style a jail and house of correction, a handsome parish-church, and a number of chapels and meeting houses, schools, and charitable institutions.

But the great edifice of Peterborough is the famous cathedral, which holds a high, if not the highest rank among English cathedrals of the second classs. The choir and eastern aisles of the transept (built 1118–33) are early Norman; the transept (1155–77) is middle Norman; the nave (1177–93) is late Norman; the western transept (dating from the same period), is transition Norman; the w. front, which, as a portico (using that term in its classical sense), is said to be the grandest and finest in Europe, is early English; and the eastern aisle (begun in 1438, but not completed till 1528), is perpendicular. The beautiful western front consists of three arches 81 ft. in height, supported by triangular piers detached from the w. wall. Each arch is surmounted by a beautiful pediment and cross. The front is flanked on each side with turrets 156 ft. high, and crowned with pinnacles. The roof of the nave is painted in lozenge-shaped divisions, containing figures of kings, bishops, grotesques, etc., in colors. A central tower, lantern-shaped, rises at the intersection of the nave and transept; this being condemned as unsafe has recently been rebuilt. In the north-choir aisle, a slab of blue stone still covers the remains of Catharine of Aragon. On the stone is carved the simple inscription, "Queen Catharine, A.D. 1536." In July, 1587, the remains of Mary, queen of Scots, were brought here from Fotheringay for interment, and here they rested until, 25 years after, they were removed to Westminster Abbey. The entire length of the cathedral is 476 ft. 5 in.; the breadth of nave and aisles, 78 ft.; height of the ceiling of the church, 78 ft.; breadth of the church at the great transepts, 203 ft.; height of lantern, 135 ft.; length of western front, 156 ft.; height of central tower from the ground, 150 feet.

Peterborough carries on an active trade in corn, coal, timber, bricks, and malt. It has also manufactures of agricultural implements. The G. N. R. have extensive locomotive works in the north suburb. There are many fairs: Pop. '91, of parl. bor. 26,500.

The original name of the town was Medeshamstede. The city had its origin in a great Benedictine monastery, founded in 655 by Oswy, king of Northumbria, and Peada, son of Penda, king of Mercia. This monastery, which became one of the wealthiest and most important in England, was reared in honor of St. Peter; but it was not until after being destroyed by the Danes in 807, and rebuilt about 966, that the town was called Peterborough. On the dissolution of the monasteries, this magnificent edifice was spared, owing, it is supposed, to its containing the remains of Queen Catharine of Aragon. See Murray's *Handbook;* Poole's *Peterborough.*

PETERBOROUGH, Lord. See Mordaunt.

PETER, EPISTLES GENERAL OF, the name given to two epistles contained in the canon of the New Testament. They are called *general,* because they are not addressed to particular churches or persons, like those of St. Paul; but (as in the case of the 1st epistle) to all the Christians scattered throughout Asia Minor, or (as in the case of the 2d) to the entire body of Christians without exception. The objects of the 1st epistle are to strengthen believers under trials; to exhort them to the earnest performance of all duties—personal, social, and domestic; and to demonstrate how thoroughly that performance depends on a spiritual recognition of Christ and his work. There is a strong eschatological tendency in the epistle; the apostle seems to grow more intensely serious, under the conviction that "the end of all things is at hand" (chap. iv. 7). That the epistle is the composition of Peter is very generally admitted. The external evidence is singularly strong; while the internal, derived from a consideration of style, sentiment, and doctrine, is equally so. We see in every sentence the ardent, impassioned, practical, unspeculative character of Peter, who held with a fine Hebraic vehemence of faith the great facts and principles of Christianity, but could not, like the more subtle and logical Paul, give them a systematic representation. Many critics have warmly praised the beauty and strength of the language.—The *second epistle* stands in a very different position from the first. So far as external authority is concerned, it has hardly any. The most critical and competent of the fathers were suspicious of its authenticity; it was rarely, if ever, quoted, and was not formally admitted into the canon till the council of Hippo, 393 A.D. The internal evidence is just as unsatisfactory. The great difference of style between it and the 1st epistle is universally admitted. Bunsen, Ullmann, and Lange hold indeed that the second chapter is an interpolation, but consider the first and third genuine. Many of the ablest critics, however, regard the whole epistle as a fabrication; and believe that its contents prove it was meant as an attack on the Gnosticism of the 2d century. [See the remarks on the second epistle of Peter in Neander's *Geschichte der Pflanzung und Leitung der Kirche durch die Apostel.*] The principal arguments adduced for maintaining its apostolic character are: 1. that its rejection would endanger the authority of the canon: 2. that it is inexplicable how the church should have received it if it had not thought that Peter was the author.

PETERHEAD, a sea-port and municipal and parliamentary burgh, in the district of Buchan, Aberdeenshire, on a peninsula, the eastmost point of land in Scotland, 44 m. n.n.e. of Aberdeen, by railway. Keith Inch, the eastern head of the peninsula and the nucleus of the town, is now separated by the harbor and is mainly occupied by fish-curing establishments. It is irregularly built, clean, and much paved with the reddish granite, called after the town, and used for polishing. The earls of Marischal, before their attainder, 1715, owned much of the parish, and were superiors of the town of Peterhead. The property was bought by the Merchant Maiden hospital of Edinburgh, the governors of which have greatly improved the town and port. Peterhead has no very striking edifices. The parish church has a granite spire, 118 ft. high, and a granite

Tuscan pillar stands on the market-cross. Peterhead has Episcopal, Free, Roman Catholic and other churches; an academy and other schools, and libraries. The chief exports are herrings, butter, grain, and granite. Peterhead was long the chief British depot of the seal fisheries and the Greenland whale fisheries carried on since 1788. It has 500 boats employed in the herring fishery. P. has a harbor on the n. with two basins, another on the s. with 600 ft. by 350 ft., with 1,500 ft. of quayage. The third or Port Henry harbor has an area of 5 acres and 850 ft. of quayage. Besides these there is a large "harbor of refuge" which has been undertaken at the national expense. On the s. side of the bay of Peterhead, and about 2½ m. from the town, are the Buchanness and its light-house, and Boddam castle ruins. The Ugie enters the sea a mile n.w. of Peterhead; and on its banks, 3 or 4 m. n.w. of the town, are the ruined castles of Inverugie and Ravenscraig. The walls of the former are still standing, and access is obtained to the roof by means of a winding staircase in one of the towers, whence a magnificent view may be had of the valley of the Ugie. Ravenscraig stands on the opposite side of the river; it is built upon a rock, and is considered a good specimen of the ancient Scottish baronial style, in the square form so common in the beginning of the 13th century. Its walls are so strong as to have been deemed impregnable previous to the use of artillery. Pop. '91, 12,200.

PETERHOF, a palace of the emperor of Russia, on the southern shore of the gulf of Finland, 15 m. w. of St. Petersburg. The palace was built by Peter the Great in 1711, contains a fine collection of paintings, and is surrounded by a beautiful park. The town of Peterhof has 9,516 inhabitants.

PETERKIN, GEORGE WILLIAM, D.D., b. Md., 1841; studied at the univ. of Virginia, 1858–9; served in the Confederate army 1861–65; graduated at the theol. sem. of Virginia, 1868; and was ordained priest in the Prot. Epis. church, 1869. He was asst. minister at St. James' church, Richmond, Va.; and rector of St. Stephen's church, Culpepper, Va., and the Memorial church, Baltimore; and was consecrated bp. of W. Va., 1878.

PETERLOO MASSACRE, the name popularly given to the dispersal of a large meeting by armed force in St. Peter's field, Manchester, Monday, July 16, 1819. The assemblage, consisting chiefly of bodies of operatives from different parts of Lancashire, was called to consider the question of parliamentary reform, and the chair, on open hustings, was occupied by Mr. Henry Hunt. The dispersal took place by order of the magistrates; several troops of horse, including the Manchester yeomanry, being concerned in the affair, of which an account will be found in *History of the Peace*, by Harriet Martineau, edition of 1858, p. 107. Five or six persons were killed and many wounded. St. Peter's field is now covered by buildings. Peterloo was a fanciful term, suggested by Waterloo.

PETERMANN, AUGUST, 1822–78; b. Prussian Saxony; educated at Nordhauser for the church, but developed a decided taste for geography, went to Potsdam in 1839, remained there 6 years and became the private secretary and librarian of Prof. Berghaus, the founder of the academy. In 1841 he drew the illustrated map for baron Humboldt's *Central Asia;* in 1845 went to Edinburgh as assistant to Mr. A. K. Johnston in his *Physical Atlas* based upon Berghaus's *Physical Geography*, on which he had worked. In 1847 he was associated with the Rev. Thomas Milner in publishing an *Atlas of Physical Geography;* went to London and became a member of the royal geographical society. He was author of an *Account of the Expedition to Central Africa*. He contributed to the *Encyclopædia Britannica*, and to the geographical division of the *English Cyclopædia*. In 1854 he was appointed professor of geography at Gotha by the duke of Saxe-Coburg-Gotha. He was for some years employed as superintendent of Justus Perthes's establishment, preparing maps; and edited a monthly journal, *Mittheilungen*, devoted to modern discoveries in geography. He contributed some of the best maps, including one of the United States in 6 parts, for the late edition of Stieler's *Hand-Atlas*, visiting the United States in 1876.

PETERMANN, JULIUS HEINRICH, 1801–76; b. Germany; educated at Leipsic and Berlin, studied Armenian at Venice, and in 1837 was called to the chair of oriental literature at Berlin. He was German consul at Jerusalem 1867–68. He published grammars of the Hebrew, Chaldaic, Armenian, and Arabic languages, and a number of works relating to oriental literature.

PETER-PENCE, the name given to a tribute which was collected in several of the western kingdoms, and offered to the Roman pontiff, in reverence of the memory of St. Peter, whose successor that bishop is believed by Catholics to be. From an early period, the Roman see had been richly endowed; and although its first endowments were chiefly local, yet as early as the days of Gregory the Great, large estates were held by the Roman bishops in Campania, in Calabria, and even in the island of Sicily. The first idea, however, of an annual tribute appears to have come from England. It is ascribed by some to Ina (721 A.D), king of the west Saxons, who went as a pilgrim to Rome, and there founded a hospice for Anglo-Saxon pilgrims, to be maintained by an annual contribution from England; by others, to Offa and Ethelwulf, at least in the sense of their having extended it to the entire of the Saxon territory. But this seems very uncertain; and although the usage was certainly anterior to the Norman conquest, Dr. Lingard is

disposed not to place it higher than the time of Alfred. The tribute consisted in the payment of a silver penny by every family possessing land or cattle of the yearly value of 30 pence, and it was collected during the five weeks between St. Peter's and St. Paul's day and Aug. 1. In the time of king John the total annual payment was £199, 8s., contributed by the several dioceses, in various proportions, which will be found in Lingard's *History of England*, vol. ii. p. 330. The tax, called Romescot, with some variation, continued to be paid till the reign of Henry VIII., when it was abolished. By Gregory VII. it was sought to establish it for France; and it appears also in Denmark, Sweden, Norway, and Poland. This tribute differs from the payments of the feudatory kingdoms, such as Naples, Aragon, and England under the reign of John.

The pope having suffered a considerable diminution of his own revenue since the revolution of 1848, an effort has been made in several parts of Europe to revive this tribute. In some countries it has been very successful, and the proceeds have been among the chief of the resources by which Pius IX. was so long enabled to meet the pressure of pecuniary embarrassments caused by his diminished territorial possessions. The average annual amount of this collection for the ten years, 1880–1890, was about $2,600,000. See POPE.

PETERS, ABSALOM, D.D., 1793–1869; b. N. H.; graduated at Dartmouth college in 1816, and Princeton theological seminary in 1819; was pastor of the Congregational church at Bennington, Vt., 1820–25; secretary of the American home missionary society until 1837; edited the *Home Missionary and Pastor's Journal;* edited the *American Biblical Repository;* professor of pastoral theology and homiletics in the Union theological seminary, New York, 1842–44; and pastor of the First church (Congregational), Williamstown, Mass., 1844–57; originated while there and edited the *American Eclectic*, and the *American Journal of Education.* He published *A Plea for Voluntary Societies; Sprinkling the only Mode of Baptism; Sermon against Horse-Racing; Sacred Music.* After he had passed his 70th year he published a volume of poems.

PETERS, CHRISTIAN HEINRICH FRIEDRICH, PH.D.; b. Germany, 1813; graduated at the university of Berlin, after which he traveled for several years making scientific investigations in Italy and the eastern countries. He went to the United States, and was employed by the government in making coast surveys. In 1858 he accepted the professorship of mathematics and astronomy at Hamilton college, and was director of the Litchfield astronomical observatory, where he made many valuable discoveries concerning comets and asteroids; he also determined the exact longitude of several points in the state, and of Ann Arbor, Mich., which was an essential point in the U. S. lake survey; also determined the western boundary of New York state. In the observation of the total solar eclipse, Aug. 7, 1869, he was at Des Moines, Iowa, and took a prominent part. Prof. P. discovered 22 asteroids, catalogued 16,000 zodiacal stars, and recorded more than 20,000 solar spots. He had charge of the party sent by the United States to New Zealand to observe the transit of Venus, Dec. 9, 1874, and his were the only successful observations made on that island. Professor Peters died in 1890.

PETERS, OR **PETER**, HUGH, 1599–1660; b. England; was ordained and preached at the church of St. Sepulchre, London, until he was silenced and imprisoned for non-conformity. When liberated he went to Rotterdam, and became pastor of the Independent church; was in New England from 1635 to 1641; was settled pastor of the First church in Salem, Mass., as successor of Roger Williams. In 1658 he was chaplain to the garrison at Dunkirk. After the restoration, being suspected of complicity in the king's death, he was committed to the Tower, indicted for high treason, condemned, and beheaded Oct. 16, 1660. During his imprisonment he wrote several letters of advice to his daughter, which were published in 1717 under the title of *A Dying Father's last Legacy to an only Child.* He published *Peters's last Report of the English Wars; A Word for the Army and Two Words for the Kingdom; A Good Work for a Good Magistrate.*

PETERS, JOHN CHARLES, b. N. Y., 1819; studied medicine in the medical department of Columbia college, and in Europe, and commenced practice in New York as a homeopathist, but afterwards became an allopathist. He was one of the first members of the New York pathological society; was president of the medical library and journal association; and published treatises on diseases of the head, diseases of females, diseases of the eyes, and Asiatic cholera. In connection with Dr. Wotherspoon, he translated Rokitansky's *Pathological Anatomy*, and with Dr. E. F. Snelling, and others, he published a *Materia Medica.* Dr. Peters was editor of the *North American Journal of Homeopathy*, and of the *Transactions* of the pathological society. He d. in 1893.

PETERS, KARL, a German traveler, was born Sept. 27, 1856, studied at Göttingen, Tübingen and Berlin, where he became professor in 1880. He founded the German Colonization Company, in whose interests he traveled through eastern Africa. Returning to Germany in 1885 he became the head of the German East Africa Company and two years later went again to Africa. In 1888 he took the leadership of an expedition for the relief of Emin Pasha, reached Zanzibar in Feb. 1889, and marched up the Tana river to its source and penetrated finally to Victoria Nyanza. Thence he crossed the lake to Usukuma and Mpwapwa and met Emin, after which he returned to the coast. He was sent as imperial commissioner to East Africa; founded a station at Kilima Njaro, and was active in the settlement of the boundary between German and English possessions. He has published *Willenswelt und Weltwille* (1883), a philosophical study; *Die deutsche Emin Pascha-Expedition* (1891); *Das Deutsche-Ostafrikanische Schutzgebiet* (1895); *Die goldene Ophir Salomos* (1895).

PETERS, Richard, 1744–1828; b. Blockley, Penn.; graduate of Philadelphia college; studied law, with great success at the outset. He had brilliant social qualities, wit, and conversational powers of a high order, speaking German fluently. In the revolutionary war he was capt. of a militia company, and secretary of the board of war from June, 1776, to Dec., 1781; judge of the U. S. district court of Pennsylvania from 1789 to his death. In 1797 he published an account of some experiments by which he had ascertained the value of the use of gypsum in agriculture, thus introducing it to the farmers of the country. He contributed valuable articles to the Philadelphia agricultural society, of which he at one time was president. In 1780–1807 he published *Admiralty Decisions in the U. S. District Court of Pennsylvania*, 2 vols. His son, Richard, jr., was successor of Henry Wheaton as reporter of the U. S. superior court, and has published numerous condensed reports of the U. S. superior and circuit courts, *Case of the Cherokee Nation against the State of Georgia;* also editor of *Chitty on Bills;* and Washington's *Circuit Court Reports*, 3d *Circuit* (1803–27), 4 vols.

PETERS, Samuel, d.d., ll.d., 1735–1826; b. Hebron, Conn.; graduate of Yale college, 1757. In 1758 he went abroad for a year. Returning to Connecticut in 1759, he became a clergyman of the Episcopal church, and was placed in charge of the churches of Hebron and Hartford. He was a tory, so pronounced in his loyalty that he was forced to take flight to England, where, in 1781, he seems to have revenged himself by publishing a *General History of Connecticut*, absurdly untruthful—among other misrepresentations, setting forth a code of "blue laws," which had no existence. In 1794 he was chosen (but never consecrated) bishop of Vermont. In 1805 he came to New York, and published, 1807, a *History of Rev. Hugh Peters*, his great-uncle; and a history of Hebron. In 1817 he visited the falls of St. Anthony, taking up a claim there of a large extent of country. He is the original of the "Parson Peter" in Trumbull's *M'Fingal.*

PETERS, Wilhelm Karl Hartwig, 1815–83; b. Coldenbuttel, Schleswig. He became known as a naturalist first by his exploration of Mozambique, 1842, under the auspices of the Prussian government. He described his exploration in a work of 4 vols., 1852–68. From this work Bleek compiled his *Languages of Mozambique.* For many years he was connected with the medical dept. of the univ. of Berlin, and became prof. of zoology and director of the zoological collections, 1857.

PETERSBURG, a city at the junction of Chesterfield, Dinwiddie, and Prince George cos., Va.; independent of co. authority; on the Appomattox river, the Upper Appomattox canal, and the Norfolk and Western and Atlantic Coast Line railroads; 22 m. s. of Richmond. It was founded in 1733; incorporated as a town in 1748; and chartered as a city in 1850. Large water power for manufacturing and milling is provided by the canal. The city contains the central state hospital for the insane, home for the sick, mechanics' association library, two public parks, Blandford cemetery, many points of interest connected with the civil war, electric light and street railroad plants, national and state banks, and manufactories of tobacco, flour and cotton goods. It has a large export tobacco trade. In June, 1864, Lieutenant-General Grant, with an army of about 100,000 men, was at City Point, at the junction of the James and Appomattox, and Lee, crossing the Chickahominy, had taken up a position protecting Richmond from attack on the n. and e. banks of the James. The federal forces assaulted Petersburg, June 15–18, but were repulsed with a loss of over 10,000 men. The siege of Petersburg began June 19. Mines were exploded, and a number of unsuccessful attempts made to take the city by storm, till, after a week's bombardment, Gen. Lee evacuated it, April 2, 1865. Pop. '90, 22,680.

PE'TERSEN, Clemens, b. Denmark, 1834; educated at the Copenhagen university, where he took a course of study in philosophy and theology, and from 1853–69 was connected with a Danish paper as critic. In 1869 he came to the United States, settled in New York, contributed to many papers and periodicals, and was engaged in editorial work in the preparation of Johnson's *Cyclopedia.*

PE'TERSFIELD, a parish and market t. in Hampshire, 16½ m. n.e. by e. of Portsmouth and on the London and Southwestern railway. It is a pleasant country town, and contains a Norman parish chapel of the 12th c., and an educational institution called Churcher's college. An equestrian statue of William III. once richly gilt, stands in the market-place. Petersfield returned a member to the house of commons until 1885. Pop. '91, 2002.

PETER'S PENCE. See Peter-Pence.

PETER THE GREAT BAY, an inlet 100 m. wide, running 50 m. inland on the coast of Russian Manchuria, and extending from the Korean frontier to Cape Povorotnyi.

PETERWAR'DEIN, a t. in the Austrian province of Croatia and Slavonia, and one of the strongest fortresses in the Austrian dominions, is situated on the right bank of the Danube, opposite Neusatz. The ordinary garrison is a very strong one, and besides it, the town and suburbs contain a population of, '90, 3,777. The most ancient part of the fortifications, the upper fortress, is situated on a rock which on three sides rises abruptly from the plain. Peterwardein is situated on a narrow peninsula, and is named in honor of Peter the hermit. In 1688 the fortifications were blown up by the imperialists, and the town was soon after burned to the ground by the Turks; but at the peace of Passarowitz, on July 21, 1718, it remained in the possession of the emperor.

It was here, that on Aug. 5, 1716, prince Eugene obtained a great victory over the grand vizier Ali. In 1749 the town capitulated to the Austrians.

PETH'ERICK, JOHN, b. England; went to Egypt, 1845, engaged in mining, attached himself to the service of Mehemet Ali, and in 1847 was sent to Kordofan. He passed several years in the region of the upper Nile, and retired from the service on the death of Mehemet Ali to accept the position of British consul at Khartoum, engaging in mercantile pursuits. In 1859 he went to England. He published, 1861, *Egypt, the Soudan, and Central Africa, with Explorations from Khartoom on the White Nile to the Regions of the Equator.*

PETIC', or PITIC, now called Hermosillo, a t. in the state of Sonora, Mex., on the lower part of the river of the same name; pop. '89, 7,071. Its port, Guaymas, is reached by the Southern Pacific railway. It contains the capital, court house, theater, etc. From it are shipped large quantities of wine, wheat, and fruit, the products of the fertile and thickly-populated valley at the entrance to which it is situated.

PETIGRU, JAMES LOUIS, 1789–1863; b. S. C.; of Huguenot and Irish descent; educated in the state college, and after graduating in 1809 studied law and practiced in Abbeville and Charleston. From 1822 to 1830 he was the attorney-general of South Carolina. From the time when Calhoun enunciated his doctrine of nullification (q.v.) until Mr. Petigru's death, he was in a position of opposition to the general sentiment of the community in which he lived, as he was an uncompromising antagonist of both nullification and secession. Though incurring personal odium for this cause, his personal character and professional ability maintained him in the position of the foremost lawyer at the state bar. Before the war he was U. S. district attorney for a short time, was a member of the legislature, and in 1861 took part in codifying the state statutes, and was president of the South Carolina historical society.

PE'TIOLE. See LEAVES.

PÉTION, ANNE ALEXANDRE SABÉS, 1770–1818; b. Port-au-Prince; first president of the republic of Hayti; educated at a military school in France. In the revolution in St. Domingo he was first made an artillery officer, then raised to the rank of adjt.gen. He was associated with Rigaud in opposition to Toussaint L'Ouverture; but failed in his projects and set out for France, returning with a col.'s commission under Gen. Leclerc. Not coinciding with the violent measures of Leclerc or Rochambeau, he left their service, and joining himself to Dessalines drove the French from those shores. In 1804, with the help of the English, they established the independence of Hayti. He was made governor of the western district, embracing Port-au-Prince, Dessalines being chief. His election as president, Jan. 27, 1807, was disputed by Christophe, occasioning a civil war, but he retained his office till death.

PÉTION DE VILLENEUVE, JÉROME, noted for the part he played in the first French revolution, was the son of a procurator at Chartres, and was born there in 1753. He was practicing as an advocate in his native city when he was elected in 1789 a deputy of the *tiers état* to the states-general. His out-and-out republican principles, and his facile oratory, sonorous rather than eloquent, quickly made him popular, though he had an essentially mediocre understanding, and was altogether a windy, verbose personage. He was a prominent member of the Jacobin club, and a great ally of Robespierre; the latter was called the "incorruptible," and Pétion de Villeneuve the "virtuous." He was sent along with Barnave and Latour-Maubourg to bring back the fugitive royal family from Varennes, and in the execution of this commission he acted in an extremely unfeeling manner. He afterward advocated the deposition of the king and the appointment of a popularly-elected regency, and along with Robespierre received, Sept. 30, 1791, the honors of a public triumph. On Nov. 18, he was elected *maire de Paris* in Bailly's stead, the court favoring his election, to prevent that of Lafayette. In this capacity he encouraged the demonstrations of the lowest classes and the arming of the populace. But as the catastrophe drew near he awoke to a sense of its terrible nature, and sought in vain to arrest the torrent. On the triumph of the terrorists, Pétion de Villeneuve's popularity declined, and he joined the Girondists. On the king's trial he voted for death, but with delay of execution and appeal to the people, upon which he became suspected of being a royalist, and of partaking in the treason of Dumouriez. He was thrown into prison, June 2, 1793, on the fall of the Gironde, but escaped from prison and joined the other Girondists at Caen. Upon the defeat of their army by that of the convention, he fled, in July, 1793, into Bretagne, and in company with Buzot reached the neighborhood of Bordeaux, which, however, had already submitted. A short time after, Pétion de Villeneuve's and Buzot's corpses were found in a corn field near St. Emilion, partly devoured by wolves. They were supposed to have died by their own hands. Pétion de Villeneuve's character has been defended by Mme. de Genlis and Mme. Roland. It appears that he was extremely virtuous in all his domestic relations; but, on the other hand, his public career shows him to have been weak, shallow, ostentatious, and vain. *Les Œuvres de Pétion*, containing his speeches, and some small political treatises, were published in 1793.

PETI'TIO PRINCIP'II ("a begging of the principle or question") is the name given in logic to that species of vicious reasoning in which the proposition to be proved is assumed in the premises of the syllogism.

PETITION (Lat. *peto*, I ask), a supplication preferred to one capable of granting it. The right of the British subject to petition the sovereign or either house of parliament for the redress of grievances is a fundamental principle of the British constitution, and has been exercised from very early times. The earliest petitions were generally for the redress of private wrongs, and the mode of trying them was judicial rather than legislative. Receivers and triers of petitions were appointed, and proclamation was made inviting all persons to resort to the receivers. The receivers, who were clerks or masters in chancery, transmitted the petitions to the triers, who were committees of prelates, peers, and judges, who examined into the alleged wrong, sometimes leaving the matter to the remedy of the ordinary courts, and sometimes transmitting the petition to the chancellor or the judges, or, if the common law afforded no redress, to parliament. Receivers and triers of petitions are still appointed by the house of lords at the opening of every parliament, though their functions have long since been transferred to parliament itself. The earlier petitions were generally addressed to the house of lords; the practice of petitioning the house of commons first became frequent in the reign of Henry IV.

Since the revolution of 1688, the practice has been gradually introduced of petitioning parliament, not so much for the redress of specific grievances as regarding general questions of public policy. Petitions must be in proper form and respectful in language; and there are cases where petitions to the house of commons will only be received if recommended by the crown, as where an advance of public money, the relinquishment of debts due to the crown, the remission of duties payable by any person, or a charge on the revenues of India have been prayed for. The same is the case with petitions praying for compensation for losses out of the public funds. A petition must, in ordinary cases, be presented by a member of the house to which it is addressed; but petitions from the corporation of London may be presented by the sheriffs or lord mayor. Petitions from the corporation of Dublin have also been allowed to be presented by the lord mayor of that city, and it is believed that a similar privilege would be acceded to the lord provost of Edinburgh.

The practice of the house of lords is to allow a petition to be made the subject of a debate when it is presented; and unless a debate has arisen on it, no public record is kept of its substance, or the parties by whom it is signed. In the house of commons, petitions not relating to matters of urgency are referred to the committee on public petitions, and in certain cases ordered to be printed.

The constitution of the United States, like that of Great Britain, guarantees to every citizen the right of petition for a redress of grievances.

PETITION OF RIGHTS, a declaration of certain rights and privileges of the subject obtained from king Charles I. in his third parliament. It was so called because the commons stated their grievances in the form of a petition, refusing to accord the supplies till its prayer was granted. The petition professes to be a mere corroboration and explanation of the ancient constitution of the kingdom; and after reciting various statutes, recognizing the rights contended for, prays "that no man be compelled to make or yield any gift, loan, benevolence, tax, or such like charge, without common consent by act of parliament; that none be called upon to make answer for refusal so to do; that freemen be imprisoned or detained only by the law of the land, or by due process of law, and not by the king's special command, without any charge; that persons be not compelled to receive soldiers and mariners into their houses against the laws and customs of the realm; that commissions for proceeding by martial law be revoked." The king at first eluded the petition, expressing in general terms his wish that right should be done according to the laws, and that his subjects should have no reason to complain of wrongs or oppressions; but at length, on both houses of parliament insisting on a fuller answer, he gave an unqualified assent on June 26, 1628.

PETITOT, Louis Messidor Lebon, 1794–1862; b. Paris; son of Pierre, with whom he studied the art of sculpture, subsequently attending the school of fine arts in his native city, won the prize, 1814, and went to Rome. In 1820 he returned to Paris. In 1821 he produced "Ulysses Visiting Alcinous;" 1822, "St. John the Baptist;" 1824, "A Young Sportsman Bitten by a Serpent;" 1847, "A Calabrese Pilgrim and his Son Imploring the Aid of the Virgin," which was given a conspicuous position in the garden of the Luxembourg.

PETIT PARIS. (Little Paris). A name often given to the city of Brussels (q.v.).

PE'TO, Sir Samuel Morton, b. England, 1809; was apprenticed to his uncle, a builder, at whose death, in 1830, he succeeded to a half interest in the business, in partnership with another. In 1845 he retired from the firm, and conducted the building of railroads on his own account, constructing a large portion of the leading railway works in England. He built the Norwegian Grand Trunk line and the Royal Danish line in 1854; receiving for the latter service, and as a testimonial to his ability, the order of Darmebrog, presented to him by the king of Denmark. He constructed, without pros-

pect of profit, the railway from Balaklava, during the Crimean war; and, in recognition of this patriotic service, received a patent of baronetcy, Feb. 22, 1855. He built two chapels in London, for the Baptist denomination, at his own expense. He entered parliament in the liberal interest in 1847; was re-elected in 1852; and retired in 1854. In 1859 he was again elected; and again in 1865; but retired finally in 1868, on account of the bankruptcy of the firm of Peto, Betts and Crampton, with liabilities amounting to more than £7,000,000. He wrote *Taxation, its Levy and Expenditure;* and *Resources and Prospects of America,* having visited the latter country, and examined its railroad system and industries. He also constructed one of the Canadian railways. He d. in 1889.

PETÖFI, SANDOR (ALEXANDER), who may fairly be described as the national poet of Hungary, was born at Little Körös, in the county of Pesth, Jan. 1, 1823. His father was a butcher, and a small landowner in Little Kumania, and bore the name of Petrovich (son of Peter)—a name indicating a Slavonic origin, which the poet, when he came to manhood, exchanged for the Magyar equivalent, Petöfi. In 1838 his father was reduced to poverty by an overflowing of the Danube, which destroyed his little estate; and it was by the help of relatives that he was able to carry out his design of educating his son for a profession. Petöfi was sent to the lyceum of the town of Schemnitz. It was while there that he began to write verses, and first displayed the extravagant fondness for theatricals which characterized him throughout life. From the first he neglected his studies; ultimately, he ran away with a band of German strollers. His father after some time found him out, and brought him home, and he remained for a period in quasi-custody among his relatives. When at length he was again sent to school at Oedenburg, he almost immediately ran away, and enlisted as a common soldier. After he had been about two years in the army, a physician, who had taken pity upon him, procured his discharge, and he went back to his relations. He afterwards went to Pápá, to complete his education. His passion for the stage, however, drew him away from Pápá, as it had formerly done from Schemnitz; in 1842 he left it to join a troop of comedians. His stage attempts were utter failures, and he soon parted from the comedians, if, indeed, he was not dismissed by them. He made his way to Presburg, and afterward to Pesth, where he got some employment as a translator from the English and the French. Among other works, he translated a novel by Mr. G. P. R. James. As soon as his literary labor supplied him with the means of traveling, his passion for the stage returned upon him; he went to Debreczin, and made another venture as an actor—playing the part of Othello—but failed even more completely than before. At last he had the good fortune to be invited to contribute to a newspaper at Pesth—the *Devallap*—and he immediately closed with the proposal. He made his way on foot from Debreczin to Pesth—a distance of nearly 200 m.—wearing shoes padded with straw, and carrying in his bosom a MS. volume of verses, his whole provision for the journey consisting of two florins, which he got from an old school-fellow. It was on his arrival at Pesth that he exchanged the name of Petrovich for Petöfi. Within a few weeks of his arrival he had troops of friends and a reputation.

He introduced himself to Vörösmarti, then the most popular poet of Hungary, who received the shabbily-dressed stranger coldly, and did not readily consent to listen to his verses. But when he had listened, he expressed his admiration warmly, "Hungary," he exclaimed, "never had such lyrics: you must be cared for." And from that time he treated Petöfi as a son, and never rested until his merits were fully acknowledged by his countrymen. Petöfi was almost at once received into the literary national circle, at the expense of which was published his *Versek*, which appeared in 1844. This was soon followed by other volumes, which succeeded each other with amazing rapidity; all of them, though regarded as vulgar by some of the critics, obtaining an unbounded popularity; so that it was said of Petöfi that "he never went to bed at night, he never arose in the morning, without hearing his songs from the multitudinous passengers in the public streets." He sprang almost at a bound into a position in Hungary similar to that which Burns held in Scotland—that at once of the greatest poet and the representative man of his country. In 1848, when the revolutionary movement which spread over Europe began to affect the Hungarians, his energies and enthusiasm found a more useful direction; he became, by speech and pen, the advocate of the independence of Hungary. He was for some time a member of the diet, but in Oct., 1848, he became a capt. in the Hungarian army; and in the beginning of 1849 he was appointed adjutant and secretary to gen. Bem. He was present at the battle of Schässburg, fought on July 31, 1849, in which Bem's army was defeated with great slaughter; and he was never heard of after that battle. It is believed that he was trampled to death in the flight, and that his body, so defaced as to escape recognition, was buried with the multitude of Magyar dead left upon the field. His countrymen long believed that he was not dead, but a prisoner in an Austrian dungeon; and it is said that among the peasantry this belief is cherished still. Several false Petöfis have made their appearance since his death, and much spurious poetry has been published under his name. Lately, however, his countrymen have subscribed for the erection of a monument to his memory, and have purchased, with a view to its preservation, the house in which he was born at Little Körös. He left a widow—who married again—and one son. His brother, STEPHEN, has gained some reputation as a poet.

His poems, 1775 in number, were published in 10 volumes. Most of them are lyrics, of which he published several collections, under the titles, *Cypress Leaves on Etelka's Grave; Pearls of Love; Starless Nights; Clouds.* The most celebrated of his narrative poems—also the longest—are, *Janos, the Hero; Istok, the Fool.* His earliest work was *The Wine-drinkers*, published in 1842; his latest, *The Assessor of the Judgment-seat*, which appeared in 1849. A volume, containing a poem entitled *The Apostle*, was suppressed by the Austrian government after the pacification of Hungary. Petöfi published a novel, *The Hangman's Rope*, which was by no means successful, and several volumes of tales, criticisms, and sketches of travel; and he translated largely from English and French into the Magyar.

A selection from his earlier pieces, translated into German, was published in 1845; and several volumes of translations from his writings have since appeared in Germany. They have also been translated into French, Flemish, Polish, Danish, and Italian; and an English version, comprising his finest poems, was published in 1866 by sir John Bowring. The quality of his poetry has been as fully recognized among foreigners as among his countrymen; thus, Grimm declared that "Petöfi will rank among the very greatest poets of all times and tongues;" Heinrich Heine spoke rapturously of his "rustic song, sweeter than that of the nightingale;" and Uhland avowed that only old age could prevent his learning Magyar, that he might enjoy Petöfi in his native dress.

PE'TRA (Heb. SELA, both names signify "rock") was anciently the capital of the Nabathæans, and was situated in the "desert of Edom" in northern Arabia, about 72 m. n.e. of Akabah—a town at the head of the gulf of Akabah, an arm of the Red sea. It occupied a narrow rocky valley overhung by mountains, the highest and most celebrated of which is mount Hor, where Aaron, the first Hebrew high-priest, died, and was thus in the very heart of the region hallowed by the forty years' wanderings of the Israelites. The aboriginal inhabitants were called *Horim* ("dwellers in caves"). It was then conquered by the Edomites or Idumeans (but it never became their capital); and, in the 3d or 4th c. B.C., it fell into the hands of the Nabathæans, an Arab tribe, who carried on a great transit trade between the eastern and western parts of the world. It was finally subdued by the Romans in 105 A.D., and afterwards became the seat of a metropolitan; but was destroyed by the Mohammedans, and for 1200 years its very site remained unknown to Europeans. In 1812 Burckhardt first entered the valley of ruins, and suggested that they were the remains of ancient Petra. Six years later it was visited by Messrs. Irby, Mangles, Banks, and Leigh, and in 1828 by M.M. Laborde and Linant, and since then by numerous travelers and tourists to the east, as Bartlett, Porter, and dean Stanley. Laborde's drawings give us a more vivid impression of the ruins of Petra than any descriptions, however picturesque. These ruins stand in a small open irregular basin, about half a mile square, through which runs a brook, and are best approached by an extraordinary chasm or ravine, called the Sîk, narrowing as it proceeds till in some places the width is only 12 ft., while the rocky walls of red sandstone tower to the height of 300 feet. Hardly a ray of light can pierce this gloomy gorge, yet it was once the highway to Petra, and the remains of an ancient pavement can be traced beneath the brilliant oleanders that now cover the pathway. All along the face of the rocky walls are rows of cave-tombs, hewn out of the solid stone, and ornamented with façades. These are also numerous elsewhere. Originally, they were probably dwellings of the living, not of the dead—a supposition justified by an examination of their interior; but when the Nabathæans built the city proper in the little basin of the hills, they were in all likelihood abandoned, and then set apart as the family sepulchers of those who had formerly been "dwellers in the clefts of the rocks." The principal ruins are: 1. *L-Khuzneh* ("the Treasure-house"), believed by the natives to contain, buried somewhere in its sacred inclosure, the treasures of Pharaoh. It directly faces the mouth of the gorge we have described, and was the great temple of the Petræans. 2. *The Theater*, a magnificent building, capable of containing from 3,000 to 4,000 spectators. 3. *The Tomb with the Triple Range of Columns.* 4. *The Tomb with Latin Inscription.* 5. *The Deer* or *Convent*, a huge monolithic temple, hewn out of the side of a cliff, and facing mount Hor. 6. *The Acropolis.* 7. *Kusr Farôn*, or Pharaoh's palace, the least incomplete ruin of Petra. Most of the architecture is Greek, but there are also examples of the influence of Egypt, pyramidal forms being not unknown.

PETRARCA, FRANCESCO, the first and greatest lyric poet of Italy, was the son of a Florentine notary named Petracco, who belonged to the same political faction as the poet Dante, and went into exile along with him and others in 1302. Petracco took up his residence at Arezzo, and here the future poet was born in the month of July, 1304. His original name was Francesco di Petracco, which he subsequently changed to that by which he is now known. When Petrarca was about eight years of age, his father removed to Avignon, where the papal court was then held; and here, and at the neighboring town of Carpentras, the youth studied grammar, rhetoric, and dialectics. Contrary to his own inclination, but in compliance with the wish of his father, he spent seven years in the study of law at Montpellier and Bologna; but in 1326 his father died, and Petrarca now devoted himself partly to the gayeties of Avignon, and partly to classical studies, or rather to the study of the Latin classics, as it was only towards the end of his life that he attempted to master Greek. At this time he ranked among his friends, the

jurist Soranzo, John of Florence, the apostolic secretary, Jacopo Colonna, bishop of Lombes, in Gascony, and his brother, the cardinal Giovanni Azzo da Corregio, lord of Parma, and many other noble and learned personages. His illustrious admirers—among whom were emperors, popes, doges, kings, and sovereign dukes—obviously thought themselves honored by their intimacy with the son of a poor notary, and some were even forward in proffering him their favor. But the great event in Petrarca's life (viewed in the light of its literary consequences) was his tenderly romantic and ultimately pure passion for Laura—the golden-haired, beautiful Frenchwoman. Some slight obscurity still hangs over his relation to this lady, but it is almost certain that she was no less a paragon of virtue than of loveliness. He met her on April 6, 1327, in the church of St. Clara in Avignon, and at once and for ever fell deeply in love with her. The lady was then 19, and had been married for two years to a gentleman of Avignon, named Hugues de Sade. For ten years Petrarca lived near her in the papal city, and frequently met her at church, in society, at festivities, etc. He sung her beauty and his love in those sonnets whose mellifluous conceits ravished the ears of his contemporaries, and have not yet ceased to charm. Laura was not insensible to a worship, which made an emperor (Charles IV.) beg to be introduced to her, and to be allowed to kiss her forehead; but she seems to have kept the too-passionate poet at a proper distance. Only once did he dare to make an avowal of his love in her presence, and then he was sternly reproved. In 1338, Petrarca withdrew from Avignon to the romantic valley of Vaucluse, where he lived for some years, spending his time almost solely in literary pursuits. A most brilliant honor awaited him at Rome, in 1341, where, on Easter day, he was crowned in the capitol with the laurel-wreath of the poet. The ceremonies which marked this coronation were a grotesque medley of pagan and Christian representations. Petrarca was, however, as ardent a scholar as he was a poet; and throughout his whole life, he was occupied in the collection of Latin MSS., even copying some with his own hand. To obtain these, he traveled frequently throughout France, Germany, Italy, and Spain. His own Latin works were the first in modern times in which the language was classically written. The principal are his *Epistolæ*, consisting of letters to his numerous friends and acquaintances, and which rank as the best of his prose works; *De Vitis Virorum Illustrium; De Remediis utriusque Fortunæ; De Vita Solitaria; Rerum Memorandarum Libri IV.; De Contemptu Mundi*, etc. Besides his prose epistles, Petrarca wrote numerous epistles in Latin verse, eclogues, and an epic poem called *Africa*, on the subject of the second Punic war. It was this last production which obtained for him the laurel-wreath at Rome. Petrarca, it may be mentioned, displayed little solicitude about the fate of his beautiful Italian verse, but built his hope of his name being remembered on his Latin poems, which, it has been said, are now only remembered by his name. In 1353 he finally left Avignon, and passed the remainder of his life in Italy—partly at Milan, where he spent nearly ten years, and partly at Parma, Mantua, Padua, Verona, Venice, and Rome. At last, in 1370, he removed to Arquà, a little village prettily situated among the Euganean hills, where he spent his closing years in hard scholarly work, much annoyed by visitors, troubled with epileptic fits, not over rich, but serene in heart, and displaying in his life and correspondence a rational and beautiful piety. He was found dead in his library on the morning of July 18, 1374, his head dropped on a book!—Petrarca was not only far beyond his age in learning, but had risen above many of its prejudices and superstitions. He despised astrology, and the childish medicine of his times; but, on the other hand, he had no liking for the conceited skepticism of the mediæval *savants;* and, in his *De sui Ipsius et Multorum Aliorum Ignorantia*, he sharply attacked the irreligious speculations of those who had acquired a shallow free-thinking habit from the study of the Arabico-Aristotelian school of writers, such as Averrhoes. Petrarca became an ecclesiastic, but was contented with one or two inconsiderable benefices, and refused all offers of higher ecclesiastical appointment.—The Italian lyrics of Petrarca—the chief of which are the *Rime*, or *Canzoniere*, in honor of Laura—have done far more to perpetuate his fame than all his other works. Of Italian prose, he has not left a line. The *Rime*, consisting of sonnets, canzonets, madrigals, were composed during a period of more than forty years; and the later ones —in which Petrarca's love for Laura, long since laid in her grave, appears purified from all earthly taint, and beautiful with something of a beatific grace—have done as much to refine the Italian language as the *Divina Commedia* of Dante. Of his *Rime* there have been probably more than 300 editions; the first that of Venice, 1470; the most accurate, that by Marsand (Padua, 1819; Eng. trans. by Macgregor, 1851). Collective editions of his works have been published (Basel, 1495, 1554, and 1581 *et seq.*). Of numerous lives of him the principal are those of Bellutello, De Sades, Tiraboschi, Ugo Foscolo, and Geiger (1874); in Eng., Campbell (1841); Reeve in *Modern Classics for English Readers* (1878).

PETREL, *Procellaria*, a genus of birds, sometimes ranked among *laridæ* (q.v.), and sometimes constituted into a separate family, *procellaridæ*, which is now subdivided into several genera, and distinguished by having the bill hooked at the tip, the extremity of the upper mandible being a hard nail, which appears as if it were articulated to the rest, the nostrils united into a tube which lies along the back of the upper mandible, and the hind toe merely rudimentary. They possess great power of wing, and are among

the most strictly oceanic of birds, being often seen at great distances from land. Among the *Procellaridæ* are reckoned the fulmars (q.v.), shearwaters (q.v.), etc., and the small birds designated PETRELS, of which the stormy petrel is a familiar example. These form the genus *Thalassidroma* of recent ornithological systems, the name (Gr. sea-runner) being given to them in allusion to their apparent running along the surface of the waves, which they do in a remarkable manner, and with great rapidity, particularly when the sea is stormy, and the mollusks and other animals forming their food are brought in abundance to the surface—now descending into the very depth of the hollow between two waves, now touching their highest foamy crests, and flitting about with perfect safety and apparent delight. Hence also their name petrel, a diminutive of Peter, from the apostle Peter's walking on the water. From the frequency with which flocks of these birds are seen in stormy weather, or as heralds of a storm, they are very unfavorably regarded by sailors. They have very long and pointed wings, passing beyond the point of the tail; and the tail is square in some; slightly forked in others. Their flight much resembles that of a swallow. They are to be seen in the seas of all parts of the world, but are more abundant in the southern than in the northern hemisphere. The names stormy petrel and Mother Carey's chicken are sometimes more particularly appropriated to *thalassidroma pelagica*, a bird scarcely larger than a lark, and the smallest web-footed bird known, of a sooty black color, with a little white on the wings and some near the tail. Two or three other species are occasionally found on the British shores; one of which, the fulmar petrel, breeds on the rock of the Scilly Isles, St. Kilda, the Orkneys, Shetland Isles, etc. Like many others of the family, it generally has a quantity of oil in its stomach, which, when wounded or seized, it discharges by the mouth or nostrils; and of this the people of St. Kilda take advantage, by seizing the birds during incubation, and collecting the oil in a vessel. See illus., LARKS, ETC., Vol. VIII.

PETRIE, GEORGE, LL.D., 1791–1866; b. Dublin; son of a portrait painter; studied painting in his native city, winning a prize at the age of 14. In 1816 he was permitted to place his pictures on exhibition at Somerset house, London, and was then called a skillful draughtsman. He furnished sketches of noted places in Ireland for the engravers; in 1832 was one of the editors of the *Dublin Penny Journal* (illustrated), and ten years later edited the *Irish Penny Journal* with illustrations. He gained an intimate knowledge of the archæology of Ireland, and purchased curious and rare manuscripts for the Royal Irish academy. He collected over 400 vols. of letters and documents while conducting the antiquarian and historical department of the *Ordnance Memoir;* 1 vol. was published 1839, the rest failed to appear.

PETRIE, WILLIAM MATTHEW FLINDERS, archæological explorer, was born in England in 1853. In 1875 he began, after a long course of private study, the surveys which made him one of the most celebrated of modern archæologists. In 1880 he investigated the Egyptian pyramids at Ghizeh; in 1884 he excavated the great temple at Tanis; in 1885 he discovered and explored Naucratis, and in 1886, Nebesheh and Daphnæ; in 1887, Dahshur; in 1888, Hawara; and in 1889 and 1890, he opened up the ruins of Gurob, Kahun, and Lachish. In 1891 he published *Ilahun, Kahun, and Gurob.* He became Edwards professor of Egyptology at University college, London, and a member of the council of the Royal archæological institute. His late works include *Egyptian Decorative Art* and *Egyptian Tales* (both 1895), and vol. ii. of his *History of Egypt* (1896). During his explorations he discovered a number of valuable Greek papyri. A popular account of his work will be found in Miss Edwards's book, *Pharaohs, Fellahs, and Explorers* (N. Y. 1892).

PETRIFACTION, a name given to organic remains found in the strata of the earth, because they are generally more or less mineralized or made into stone. The word has fallen very much into disuse, having given place to the terms fossil (q. v.).

PETRIFIED FORESTS. Near Holbrook, Arizona, are found in great abundance trees that have undergone siliceous petrifaction; 20 or 30 varieties, mostly palms, have been recognized. One of these petrified trees spans a chasm 100 ft. wide. Many perfect specimens are found 2 ft. in diameter. The Peabody Museum, in New Haven, has one. The coloring is very beautiful, and under the microscope the woody structure is clearly seen.

PETROGRAPHY. See GEOLOGY.

PETROI'CA, a genus of birds of the family *sylviadæ*, natives of Australia, nearly allied to the redbreast, and to which its familiar name *robin* has been given by the colonists. The song, call-note, and manners of *P. multicolor*, a species abundant in all the southern parts of Australia, very much resemble those of the European bird, but its plumage is very different: the male having the head, throat, and back jet-black.

PETROLEUM is a natural rock-oil, composed principally of hydro-carbons, with bituminous elements, and essential oils. Long known in various parts of the world by its components appearing, either as bituminous springs on the surface, or floating on

water, as naphtha. See BITUMEN, and NAPHTHA. It is, in fact, a product of natural distillation in the formation of coal-measures, and occurs as a saturative with shales, clays and coals. Prof. Newberry long ago asserted that this was the case with the grahamite of Virginia, destined to be largely used as an asphalt in street paving in this country. Similar, probably, are the asphalts of Trinidad and the Jura. See ASPHALT. Factories were established for manufacturing burning fluid from imported bog coal as early as 1854, but in 1858 the sinking of the first well changed them all to refineries. In this country the great supply of petroleum, and at present the market for the world, is in n.w. Pennsylvania, in two districts, an upper and lower. There are also districts, for as a rule, petroleum-wells are confined to an area which is always limited and well-defined, in Ohio, West Virginia, and a large, but not profitable, area in California. Petroleum wells are sunk much as artesian wells (which see), necessitating the erection of large frames, derricks, and the necessary machinery, etc., known as a "rig." A well may flow water, oil, or oil and water, depending upon the point struck in the internal reservoir. Flowing wells gradually diminish their delivery, and finally have to be pumped. Oil is found on any one of the different horizons above the Eocene, and therefore, varies in depth from over 2,000 to less than 200 feet. Three layers of sand, found at varying distances apart in the first 900 ft., serve as a mark of depth in the oil region. The oil is stored in enormous tanks, and thence transported to the refineries, to New York, the great center of export, or to the sea-board farther south. Pipe lines are now laid from the oil region to the principal refineries, and the receipts of the pipe-line companies for so many barrels in tank are negotiable like certificates of grain-delivery. Oil-cars have iron tanks upon them, and oil-barrels are very strongly made, and often serve as return freight for Italian and German ships engaged in the export of oil. Oil is refined in a still (see DISTILLATION) by applying heat, and cooling the worm. The first and highest products are the volatile oils. These are known under various names, and are used for portable or small local gas generators, air being allowed to mix in proper proportion with the material, and the vapor pumped or forced through tubes like common gas. See NAPHTHA. By applying artificial coolers a still more volatile product may be obtained. The last and heaviest products of distillation are the crude oils, dark and disagreeable in smell. They are sold at a low price, either to adulterate commercial petroleum, to be used as antiseptics, like coal-tar, or in extracting paraffine. See PARAFFINE. The medium products are the burning-fluids of commerce, known under an infinity of names, and more or less refined or adulterated. The best kerosene is simply the best "run" of benzine, most carefully treated. The product is filtered, by centrifugal, piston, or other filters, treated with ammonia or sulphuric acid, bleached, deodorized and relieved of the acid. The variety of appliances used in these processes is endless, but the work is accompanied by a noisome odor, and the production of several stinking and deleterious compounds, for which no efficient remedy has yet been discovered. From the heavier grades of middle oils and the finer crude oils, may be manufactured by careful treatment a superior article of machinery oil, now a very valuable export to England and the continent. The illuminating properties of all the products of petroleum depend upon their union in proper quantities with the air; the test of oils is their flashing point and their burning point, and varying as they do in different ratios, both should always be known. Stringent laws, based upon both these tests, can alone regulate traffic in such dangerous commodities. See KEROSENE; OIL-WELLS. The yield of petroleum, estimated twenty years before at about a million barrels, increased as shown by the following table:

	1890.	1879.	1878.
Number of bbls. of 42 gallons each,	21,486,406	16,036,000	13,750,000
Total exports	15,811,146	12,300,000	10,000,000
Home consumption or accumulation at sea-board	5,675,260	3,736,000	3,750,000

PETROLEUM V. NASBY (*pseud.*) See LOCKE, DAVID ROSS.

PETROL'OGY (Gr. science of rocks), a term recently introduced into geology to designate particular aspects of the study of rocks, apart from their organic contents. By some, it is confined to an examination of their structure and composition; by others it is extended to the study of rock-masses, their planes of division, their forms, their position and mutual relations, and other characters not bearing on the question of the geological time of their production. See GEOLOGY.

PETROMY'ZON. See LAMPREY.

PE'TRONEL, an ancient and clumsy description of pistol.

PETRONIUS, ARBITER C., a Roman voluptuary at the court of Nero, whose profligacy is said to have been of the most superb and elegant description. We know, however, very little about him. He was at one time pro-consul of Bithynia, was subsequently appointed consul, and is certified as having performed his official duties with energy and prudence. But his grand ambition was to shine as a court exquisite. He was a kind of Roman *Brummell*, and Nero thought as highly of him as did the prince regent of the famous Beau. He was intrusted by his imperial master and companion with the charge of the royal entertainments, and thus obtained (according to Tacitus), the title of *Arbiter Elegantiæ*. Nero would not venture to pronounce anything *comme il faut* until it had received

the approval of the oracle of Roman fashion. The influence which he thus acquired was the cause of his ruin. Tigellinus, another favorite of Nero, conceived a hatred of Petronius, brought false accusations against him, and succeeded in getting his whole household arrested. Petronius saw that his destruction was inevitable, and committed suicide (66 B.C.), but in languid and graceful style, such, he thought, as became his life. He opened some veins, but every now and then applied bandages to them, and thus stopped the flow of blood, so that he was for a while enabled to gossip gayly with his friends, and even to appear in the streets of Cumæ, before he died. We are told that he wrote, sealed, and dispatched to Nero, a few hours before his death, a paper containing an account of the tyrant's crimes and flagitious deeds. It has been generally supposed that Petronius is the author of a well-known work entitled, in the oldest MSS., *Petronii Arbitri Satyricon*, a series of fragments belonging apparently to a very extensive comic novel or romance (see NOVELS), the greater portion of which has perished, but there is really no satisfactory evidence to show whether or not he was so. It is probable, however, that the work belongs to the 1st c. A.D. The fragments exhibit a horrible picture of the depravity of the times; but there is no indication that the author disapproves of what he describes. The *editio princeps* of the fragments appeared at Venice in 1499; later editions are those of Burmann (Traj. ad. Rhen. 1709; 2d edit. Amst. 1743), and of Antonius (Leip., 1781) and Bücehler (Berlin, 1882). Sienkiewicz has described P. in his novel *Quo Vadis.*

PETROPAVLOVSK′, a t. of Asiatic Russia, in the province of Akmolinsk, on the river Irtish, 166 m. by rail w. of Omsk. Pop. 16,200. It is an important military station, and has a custom house. A large trade is carried on—Petropavlovsk is also the name of a small port of Russian Siberia, on the e. shore of Avatcha bay.

PETROVSK′, a t. of Russia, in the province of Saratov, 65 m. n.w. of Saratov, situated on the Medvyeditsa connected by rail with main line to Moscow. Pop. 16,100.

PETROZAVODSK′, an important mining-town in the n. of European Russia, capital of the government of Olonetz, stands on the western shore of lake Onega, 300 m. by water n.e. of St. Petersburg. A cannon-foundry was erected here in 1701 by Peter the Great, who himself had discovered the rich resources of this northern region in iron and copper ores. The town itself dates from the year 1703; and from that to the present time it has been the great center of the mining industry of the government. The Alexandrovsky arms-factory is specially deserving of notice. It was founded in 1774, and, besides other arms, it has produced many thousand pieces of cast-iron ordnance. Works are also fitted up for the preparation of steel. There is a trade in timber, corn and furs, and there is easy communication by water with St. Petersburg. Pop. '91, 12,205.

PETRUS LOMBARDUS. See LOMBARD, PETER.

PETSH, or IPEK (i.e., silk), a t. of European Turkey, in Albania, stands on the Bistritza, or White Drin, 73 m. n.e. of Scutari. It is a pleasant town; the houses are large and handsome, and, as a rule, have gardens attached, in which fruit and mulberry-trees are cultivated. Silk is extensively made, tobacco and fruits are largely cultivated, and arms manufactured. Petsh has a celebrated monastery, before 1690 the residence of the Servian patriarchs. Pop. 15–18,000 mostly Mohammedans.

PETTENKOFER, MAX VON, b. Bavaria, 1818; a chemist, studied at Munich, and 1845–47 was employed in the Bavarian mint; afterward prof. of medicine. He was associate editor of the *Zeitschrift für Biologie* in 1865. He wrote a valuable work on ventilation, and of his productions there were published, in 1858, *Die atmospherische Luft in Wohngebäuden;* in 1870–72, *Ueber Oehlfarbe und Conservirung der Gemäldegalerien durch Regeneration der Bilder;* in 1871, *Die Verbreitungsart der Cholera in Indien.*

PETTIGREW, CHARLES, D.D., 1748–1807; b. Penn. His father was originally of a Scottish family, and emigrated to Pennsylvania about 1770, and thence to North Carolina. In 1773 Charles became a teacher in Edenton; was ordained in the Protestant Episcopal church at London in 1775, and elected bishop of N. C. in 1794. He took a leading part in establishing the university of North Carolina.

PETTIGREW, THOMAS J., 1791–1865, b. Eng.; studied for the profession of medicine, and was appointed secretary and registrar of the medical society of London. In 1810 he founded the philosophical society of London, and 3 years later was made secretary to the royal humane society, which office he held until 1820. He was surgeon-in-ordinary to the duke of Kent, and the duke of Sussex; and being appointed librarian to the latter, compiled the *Bibliotheca Sussexiana*, one of the chief bibliographical works, on which he was engaged for 12 years. He was a friend of Coleridge; was one of the founders of the Charing Cross hospital, and of the British archæological association; and was for a long time a prominent official in the latter institution, and editor of its *Journal.* He was devoted to antiquarian research, particularly in Egyptian archæology, a fact which brought him into intimate relation with Belzoni, Wilkinson, and other Egyptologists. He published a number of works on curious and recondite subjects, including *Superstitions connected with Medicine and Surgery.*

PETTIS, a co. in w. central Missouri, drained by Muddy and Flat creeks and Black river, on the Missouri, Kansas and Texas, the Missouri Pacific and other railroads;

668 sq.m. pop. '90, 31,151 inclu. colored. The surface is diversified and heavily wooded. The soil is fertile, and the principal productions are corn, wheat, oats, hay, and live stock. It contains extensive deposits of coal. Co. seat, Sedalia.

PETTRICH, FERDINAND, 1798–1872; b. Dresden; son of Franz a sculptor, studied the art of sculpture at the academy at Dresden, and with Thorwaldsen at Rome. He came to the U. S. in his youth, was appointed director of the academy of art in Pennsylvania, and passed some time in Brazil. He is best known by his statues of "Belisarius," "Christ," and the bas-relief "Day and Night."

PETTY, Sir WILLIAM, 1623–87; b. Ramsey, Eng.; son of Anthony Petty; educated at the grammar school in his native town, and at the university at Caen, Normandy. After his return from France he held an official position in the British navy, but left it for the study of medicine at Paris, reading Vesalius with Hobbes, and visiting Leyden and Utrecht. He invented the *pentagraph*, a copying machine patented 1647, but there was then no demand for it. He went to Oxford as assistant to Dr. Clayton, prof. of anatomy, at the same time giving private instruction; obtained a fellowship at Brazenose college 1648. He was prof. of anatomy in the university of Oxford 1650; prof. of medicine in Gresham college 1651; physician to the army in Ireland 1652, serving as secretary under 3 successive lords—lieut. Lambert, Fleetwood, and Henry Cromwell; entered parliament 1658; was knighted and made surveyor-general of Ireland. He was one of the founders of the Royal society which held its first meetings at his lodgings; was the progenitor of the house of Lansdowne, and is called the founder in England of the science of political economy. Among his published works are, *The Political Anatomy of Ireland*, 1691. *Taxes and Contributions*, 1667.

PETTY BAG OFFICE, one of the branches of the court of chancery, was abolished in 1874, and its duties were transferred. The clerk of the petty bag, an officer appointed by the master of the rolls, drew up writs of summons to parliament, *congés d'élire* for bishops, writs of *scire facias*, and all original writs. A great deal of miscellaneous business was also transacted in the petty bag office, which the lord chancellor and master of the rolls were empowered to regulate and transfer from time to time. By the act of 37 and 38 Vict. c. 81, these various duties have devolved on the clerk of the crown in chancery and on officers of the supreme court.

PETTY OFFICERS, in the English navy, are an upper class of seamen, analogous to the non-commissioned officers in the army. They comprise the men responsible for the proper care of the several portions of the ship, the foremen of artificers, the signalmen, and many others. They are divided into three classes; chief petty officers, at 2s. 5d. to 6s. a day; first-class working petty officers, at 2s. 2d. a day; and second-class working petty officers at 2s. a day. Petty officers are appointed and can be degraded by the captain of the ship. Her efficiency much depends on this useful class of sailors.

PETTY SESSIONS is the court constituted by two or more justices of the peace in England when sitting in the administration of their ordinary jurisdiction. Though for many purposes statutes enable one justice to do acts auxiliary to the hearing and adjudication of a matter, yet the jurisdiction to adjudicate is generally conferred upon the justices in petty sessions, in which case there must be at least two justices present, and this is called a petty sessions, as distinguished from quarter sessions, which generally may entertain an appeal from petty sessions. For the purpose of securing always sufficient justices, the whole of the counties of England are subdivided into what are called petty sessional divisions, those justices who live in the immediate neighborhood being the members who form the court of such division. This subdivision of counties is confirmed by statute, and the justices at quarter sessions have power from time to time to alter it. Each petty sessions is held in some town or village which gives it a name, and a police-court or place is appropriated for the purpose of the sittings of the court. There is a clerk of each petty sessions, usually a local attorney, who advises the justices and issues the summons and receives the fees made payable for steps of the process. The justices in petty sessions have a multifarious jurisdiction, which they exercise chiefly by imposing penalties authorized by various acts of parliament, as penalties against poachers, vagrants, absconding workmen and apprentices, etc. They also have jurisdiction to hear charges for all indictable offenses, to take depositions of witnesses, and, if they think a case of suspicion is made out, to commit the party for trial at the quarter sessions or assizes, and to bind over the witnesses to attend. See also JUSTICE OF THE PEACE.

PETU'NIA, a genus of plants of the natural order *solanaceæ*, natives of the warmer parts of America. They are herbaceous plants, very nearly allied to tobacco, and with a certain similarity to it in the general appearance of the foliage, which has also a slight viscidity and emits when handled a disagreeable smell, but the flowers are very beautiful, and varieties improved by cultivation are amongst the favorite ornaments of our greenhouses and flower-borders. The petunias, although perennial, are very often treated as annuals, sown on a hot-bed in spring, and planted out in summer, in which way they succeed very well, even in Scotland. They are tall plants, with branching weak stems, and may readily be made to cover a trellis. Although, when treated as green-house plants, they become half-shrubby, they do not live more than two or three years. The

name petunia is from the Brazilian *petun*. The first petunia was introduced from Brazil in 1823.

PETUNTSE', a white earth used by the Chinese in the manufacture of porcelain, and said to consist of comminuted but undecomposed feldspar. It is fusible, and is used for glazing porcelain.

PET'WORTH, or SUSSEX MARBLE, is a thin layer of limestone, composed of the shells of fresh-water paludinæ. It has been long, but not extensively, used for ornamental purposes. A polished slab of it was found in a Roman building at Chichester, and pillars formed of it exist in the cathedrals of Chichester and Canterbury.

PEUTINGERIAN TABLE, the name given to a most interesting ancient document, which exhibits the military roads of the Roman empire, and indeed of the world known to the Romans. It is not, properly speaking, a map; no regard being paid to geographic position, or the extent of countries. The great lines of road are laid down in a narrow strip, as if nearly parallel, all proceeding from Rome as a center; and as to rivers, it only appears whether they cross the road from left to right or from right to left of the traveler proceeding from Rome. The Mediterranean and other seas are represented by mere narrow channels. A small house is the mark for a town; important towns and military stations are distinguished by walls and towers. Rome, Constantinople, and Antioch are each represented by a circle, within which is a human figure seated; in the case of Rome the figure is crowned. Until very recently a portion of the only copy of this valuable relic of antiquity known to exist was evidently wanting, as it terminated abruptly on the west at the confines of Spain, and included only the eastern parts of Britain. In the e. it traces roads through India to a number of places of trade as far as the mouths of the Ganges. It is on parchment, and as described in all the publications devoted to it, 21 ft. in length, and about 1 foot wide. It was found in the library of the Benedictine monastery at Tegernsee, in upper Bavaria, in the 15th c., by Conrad Celtes, who bequeathed it to Conrad Peutinger of Augsburg, a zealous antiquary, and one of the earliest authors on the Roman and other antiquities of Germany. Peutinger began to prepare a copy of it for publication, but died before he could accomplish his purpose, which, however, was partially executed by Mark Welser, in his *Fragmenta Tabulæ Antiquæ ex Peutingerorium Bibliotheca* (Venice, 1591). The ancient document itself remained in the hands of the Peutinger family, and attracted no further notice till it was offered for sale in 1714, and purchased by prince Eugene, who presented it to the imperial library of Vienna, in which it still remains. An exact copy of it was published at Vienna in 1753, with an introduction and index by F. C. von Scheyb. It was again published as an appendix to Katancsich's *Orbis Antiquus* (Ofen. 1825); and at the request of the academy of Munich, a revised edition, with an introduction, was published by Conrad Mannert (Leip. 1824). Since that time a leaf detached from the rest has been found in the imperial library at Vienna. See Miller's edition of the same, Ravensburg (1888).

The Peutingerian table does not always agree with the Antonine itinerary (see ITINERARY); some stations and towns being marked in the one which are not in the other, the distances marked being also sometimes different. But the two together throw great light on ancient geography. It appears almost certain from internal evidence that the Peutingerian table belongs to the 3d c. of the Christian era, or the beginning of the 4th, although the existing copy seems to belong to a later date. The general character of the work seems to show that its authorship is to be referred to times of prevalent paganism; whilst a few things appear, probably alterations or insertions of a copyist, which refer to Christianity.

PEWEE, a common name given to several species of American insectivorous birds, of the sub-order *clammatores*, family *tyrannidæ*, and related, of course, to the common barn-yard fowl, but more nearly to the king-bird and other fly-catchers. The common pewee or phœbe bird (*sayornis fuscus*, Baird) measures about 8 in. across the extended wings. It is a beautiful brown on the back, darker on the head, with a yellowish-white breast and belly; quills brown, slightly edged with a lighter color, a sort of dull white. Its principal habitat is the middle and Atlantic states, from northern Maine to Florida, living in northern portions during summer and migrating to the south in the autumn. It comes north in April, and usually hatches a brood by the middle of May and another by the first of August. In October it returns to the south, migrating at night. It makes a nest like a barn swallow, attached to a wall or rafter, of mud, grass, mosses, etc., lining it with down and other soft materials, and the same bird may use the nest more than one season. It lays from four to six eggs, white, with a few reddish spots at the larger end. The hatching takes about 13 days, and in 3 or 4 days more the young birds leave the nest. This bird has been seen by Prof. Aughey in eastern Nebraska along the Missouri river, who found in its stomach numerous locusts and other insects; in one instance 43 locusts. Its note of *pee-wee*, or *phœ-be*, is well known. The WOOD PEWEE (*contopus virens*, Cab.) measures from 10 to 11 in. across the outspread wings, with the color of the back much like that of the phœbe bird, but it has two pale grayish bands across the wings, a narrow whitish circlet around the eyes, and has a greenish-yellow belly and grayish throat and breast. Its flight is rapid, with sudden sweeps when darting after its insect prey, which it pursues in the night. It also eats berries. Its note somewhat

resembles that of the phœbe bird, but is more frequently single syllabled than with that bird. It comes north two or three weeks later than the phœbe bird, some of them going as far north as New Brunswick and Nova Scotia. They return as far south in the winter as New Grenada. They also penetrate the west as far as the high central plains. One dissected by Prof. Aughey in 1869 was found to be a destroyer of locusts. Its nest is attached to the branch of a tree, the eggs four or five, light yellowish, with reddish spots at the larger end. It is very courageous, defending its nest against *all* intruders. Two broods are raised at the north where the season is long enough. Prof. Aughey also notices the western wood pewee (*contopus Richardsoni*, Baird) which resembles the "wood pewee" except having shorter legs, longer wings, and larger feet. It is found from the 60th parallel of latitude to Panama and from the great plains to the Pacific.

PEWS (anciently *pues;* Old Fr. *puys;* Dutch, *puyes;* Lat. *podium*, "anything on which to lean;" *s'appuyer*), inclosed seats in churches. Church-seats were in use in England some time before the reformation, as is proved by numerous examples still extant, the carving on some of which is as early as the decorated period, i.e., before 1400 A.D.; and records as old as 1450, speak of such seats by the name of *pues*. They were originally plain fixed benches, all facing east, with partitions of wainscoting about 3 ft. high, and sides of the width of the seat, paneled or carved; the sides sometimes rising above the wainscoting, and ending in finials or poppies, or else ranging with it and finished with a molding. After the reformation, probably under the influence of the Puritans, who, objecting to some parts of the service which they were compelled to attend, sought means to conceal their nonconformity, pews grew into large and high inclosures, containing two or four seats, lined with baize, and fitted with doors, desks, and cushions. Pews were early assigned to particular owners, but at first only to the patrons of churches. A canon made at Exeter, in 1287, rebukes quarreling for a seat in church, and decrees that none shall claim a seat as his own except noblemen and the patrons. Gradually, however, the system of appropriation was extended to other inhabitants of the parish, to the injury of the poor, and the multiplication of disputes.

The law of pews in England is briefly this: All church-seats are at the disposal of the bishop, and may be assigned by him, either (1) directly by faculty to the holders of any property in the parish; or (2) through the churchwardens, whose duty it is as officers under the bishop, to "seat the parishioners according to their degree." In the former case, the right descends with the property, if the faculty can be shown, or immemorial occupation proved. In the latter, the right can at any time be recalled, and lapses on the party ceasing to be a regular occupant of the seat. It appears that by common law every parishioner has a right to a seat in the church, and the churchwardens are bound to place each one as best they can. The practice of *letting* pews, except under the church-building acts, or special local acts of parliament, and, much more, of *selling* them, has been declared illegal. In some parts of the United States, pews in churches are a matter of annual competition, and bring large sums. Latterly, in England, there has been some discussion as to the injuriously exclusive character of the "pew system," and a disposition has been manifested to abolish pews altogether, and substitute movable seats available by all indiscriminately. Several pamphlets have appeared on the subject. In the Roman Catholic churches on the continent pews are seldom to be seen.

PEWTER, a common and very useful alloy of the metals, tin and lead. Two other kinds of pewter have a more compound character. Common, or *ley-pewter*, consists of 4 parts of tin and 1 part of lead; *plate-pewter* is made of 100 parts of tin, 8 parts of antimony, 2 parts each of bismuth and copper; another kind, called *trifle*, is composed of 83 parts of tin and 17 parts of antimony. Although these are the standard formulas, each kind is often much varied to suit the purposes of the manufacturer; the chief alteration being the addition of a large proportion of lead to the last, and a large increase of the same metal in the other two.

PEYER, JOHANN CONRAD, 1653–1712; b. Switzerland. He graduated in medicine at Basle in 1681, practiced medicine there, became professor of elocution and of logic, and afterwards of natural philosophy. He made many dissections and examinations of glands of the mucous membrane of the intestines, particularly of certain aggregations of lymphoid follicles which have since been known as Peyer's glands, or the patches or plaques of Peyer. See PEYER'S GLANDS; also, DIGESTION.

PEYER'S GLANDS, aggregations of solitary lymphoid follicles, first described by Johann Conrad Peyer (q.v.), principally found in the *ileum*, the lower division of the small intestine, and connected with the functions of digestion and chylification. See DIGESTION. The solitary glands which are not aggregated have essentially the same structure as those which make up the patches of Peyer, or "Peyer's glands."

PEYRON, VITTORE AMEDEO, Abbé, 1785–1870; b. Italy; professor of the oriental languages at Turin. He placed the study of Coptic on a scientific basis by his *Grammatica Linguæ Copticæ*, and *Lexicon Linguæ Copticæ:* edited a number of Greek and Latin texts, some of which he discovered himself, and rendered Thucydides into Italian. He was a senator of the kingdom of Italy, and corresponding member of the French institute.

PEYRONNET, Charles Ignace, Comte de, 1788–1854; b. at Bordeaux, France; whose father was one of the victims of the guillotine in 1793. He was educated for the bar, where he was eloquent but not able; a pronounced advocate of the Bourbons; entered public life with the advent of Louis XVIII. to the throne, and became minister of justice in 1821. In 1822 he proposed the law to muzzle the press, and favored all measures looking to the restoration of absolute kingly power and the feudal status, including the re-establishment of the law of primogeniture. On the dismissal of the Villèle cabinet in 1828 by Charles X., Peyronnet went with it; but became minister of the interior in 1830, and by his policy of reaction contributed to the overthrow of Charles X. the same year. He was subsequently imprisoned at Ham for illegal use of power while in office, and there wrote an *Histoire des Francs* in 2 vols.

PÉZÉNAS, a manufacturing t. of France, in the department of Hérault, on the left bank of the river of that name, 25 m. w.s.w. of Montpellier. It stands in a district remarkable for its beauty, and so well cultivated as to have received the name of the garden of Hérault. It is famous for its healthy climate and clear sky. The vicinity produces excellent wine, and oil, leather, and iron and copper goods are manufactured. The trade, however, is chiefly in brandy. Pop. '91 (comm.), 6191.

PFALZBURG, a town in German Lorraine, on the w. slopes of the Vosges, 25 m. w.n.w. of Strassburg, 2 m. n. of the Rhine and Marne canal. It passed into the hands of the French, 1661. The town commanded the passes of the Vosges, and was strongly fortified by Vauban, 1680; but the defenses were razed by the Germans on their capture of the place after four months' siege, 1870. It contains shoe and hat factories. Pop. '95, with garrison, 3887.

PFEFFERS, or Pfäffers, an extraordinary and much-visited locality in the canton of St. Gall, Switzerland, 5 m. s.e. of Sargans. It has been famous since the middle of the 11th c. for its hot baths, situated 2,265 ft. above sea-level, and 520 ft. above the village of Ragatz. The old baths of Pfeffers are built on a ledge of rock a few feet above the roaring torrent of the Tamina, and are hemmed in by walls of rock towering above them to the height of 600 ft., and so far burying the baths within the gorge that, even in the height of summer, sunlight appears above them only from ten to four. Above the old baths, the walls of the ravine of the Tamina contract until they meet, covering up the river, which is there seen from a cavernous gap. The hot springs are reached from the baths by means of a railed platform. This platform, leading to the hot spring, is secured to the rocks, and the Tamina churns its way through the cleft 30 or 40 ft. below.

PFEIFFER, Ida (*née* Reyer), a celebrated female traveler, was b. at Vienna, Oct. 15, 1797, and from her earliest years showed a resolute and fearless, but not unfeminine disposition. In 1820 she married an advocate, named Pfeiffer, from whom she was obliged to obtain a separation, after she had borne him two sons, Oscar and Alfred, whose education devolved on herself. When she had settled them in life, and was free to act as she pleased, she at once proceeded to gratify, at the age of 45, her long-cherished inclination for a life of travel and adventure. Her first expedition was to the Holy Land. She left Vienna in Mar., 1842, and returned in December of the same year, having traversed, alone and without guide, European and Asiatic Turkey, Palestine, and Egypt. She published an account of her eastern rambles in the following year (*Reise einer Wienerin in das Heilige Land*), which, like all her other works, has gone through many editions, and been translated into French and English. In 1845 she visited northern Europe —Sweden, Norway, Lapland, and Iceland—and recorded her impressions in her *Reise nach dem Skandinavisch, Norden und der Insel Island* (2 vols., 1846). But these journeys, which would have satisfied most women, were but little excursions in the eyes of this insatiable nomad, and only served to whet her appetite for something vaster. She resolved on a voyage round the world, and on June 28, 1846, sailed from Hamburg in a Danish brig for Brazil. Her descriptions of the scenery of that country and of the inhabitants—both native Indians and Brazilians—are exceedingly interesting. She then sailed round cape Horn to Chili, and thence, after some time, across the Pacific to Otaheite, China, and Calcutta; crossed the Indian peninsula to Bombay, whence she took ship for the Persian gulf, landed at Bassora, traversed a great part of western Asia, southern Russia, and Greece, and re-entered Vienna, Nov. 4, 1848. Two years later she published a narrative of her travels and adventures, entitled *Eine Frauenfahrt um die Welt* (Vienna, 1850, 3 vols.). As a small recognition of her services, and of her singular energy, fortitude, and perseverance of her character, the Austrian government granted Mme. Pfeiffer a sum of $500. She now determined to go round the world again, but by a different route. Proceeding to England, she, in May, 1851, took ship for Sarawak, rounding the cape of Good Hope, penetrated alone to the heart of Borneo, visited Java and Sumatra, lived for a time with some cannibal tribes, and sailed from the Moluccas to California, thence to Peru, scaled the peaks of Chimborazo and Cotopaxi, made a run through the principal of the United States, and returned to London in 1854. This second voyage, signalized by several scientific observations, is described in *Meine*

Zweite Weltreise (Vien., 1856). But the more she traveled, the fiercer became her hunger for movement. In Sept., 1856, she set out on what was to be her last expedition — namely, to Madagascar. After enduring terrible hardships, she got away, and came home to Vienna—to die. Her death took place Oct. 28, 1858.

PFENNIG is a division of currency in Germany equal to one-hundredth of a mark. The mark equals one English shilling, or twenty-five cents in U. S. money, therefore the pfennig equals two and a half mills in U. S. or decimal currency.

PFORZHEIM, an important manufacturing t. of the grand duchy of Baden, on the northern border of the Black Forest, stands on the Enz, at its confluence with the Nagold and Wurm, 16 m. s.e. by e. of Karlsruhe, and on a recently constructed branch of the Mannheim and Basel railway. Pforzheim contains the remains of an ancient castle, formerly the residence of the margraves of Baden-Durlach; several churches; a convent; industrial and other schools; chemical and iron works; machine-shops, tanneries, and paper and other factories. It is the largest manufacturing center of cheap jewelry in the world, introduced by French emigrants. Pop. '91, 33,331.

PHÆDO, or **PHÆDON**, b. Greece 4th c.; taken prisoner in war and made a slave Coming to Athens he became acquainted with Socrates, who induced Alcibiades or Crito to release him from servitude. He wrote a number of dialogues, was the founder of the Eleatic school of philosophy, and is the person to whom Plato inscribed his dialogue of that name.

PHÆDRA, in Greek legend and tragedy, the daughter of Minos, king of Crete, and of Pasiphaë, sister of Ariadne and wife of Theseus. Venus, enraged against Hippolytus, Phædra's step-son, for neglecting her worship, and against Phædra, as being the daughter of Pasiphaë, inspired the latter with a passion for Hippolytus. On the rejection of her advances, she falsely accused the youth to Theseus, who demanded his life from Neptune. Hippolytus was thrown from his chariot on the sea-shore and dragged upon the sands till dead. Phædra died by her own hand and Theseus learned too late that he had destroyed his son without cause. This story, with modifications, was the subject of tragedies by Sophocles and Euripides, and Racine's Phédre, 1677, is one of the masterpieces of the French drama.

PHÆ'DRUS, a Latin poet, whose works consist of fables. He was probably a Thracian or Macedonian, carried to Rome as a slave in his childhood, and brought up at the court of Augustus, who emancipated him. Under Tiberius, he was exposed to great danger from the hostility of Sejanus, but lived to see that general's overthrow, and died at an advanced age, probably in the reign of Claudius. Five books of fables, after the manner of Æsop, and called *Fabulæ Æsopiæ*, have been usually ascribed to him. The faults of the style have led, however, to the suspicion, not merely of alterations at a later date, but of later, and even much later, composition. The dry "morals" have been supposed to indicate the middle ages as the period to which the work should probably be referred; but its authenticity is generally admitted. The first edition was published at Troyes in 1596. The text has subsequently occupied the attention of some of the greatest scholars and critics, from the days of Burmann and Bentley to the present time. A sixth book, containing 32 fables, has recently been discovered and published, of the authenticity of which, however, there are greater doubts than that of the other books. The best editions are those of J. C. Orelli (Zürich, 1831) and L. Müller (Leip. 1877).

PHÆNOG'AMOUS PLANTS. See PHANEROGAMOUS PLANTS.

PHAËTHON (i.e., the shining), in the writings of Homer and Hesiod, a frequent title of Helios the sun-god, and subsequently employed as his name.—Phaëthon, in Greek mythology, is also the name of a son of Helios, famous for his unfortunate attempt to drive his father's chariot. Scarcely had the presumptuous youth seized the reins, when the horses, perceiving his weakness, ran off, and approaching too near the earth, almost set it on fire. Whereupon the earth cried to Jupiter for help, and Jupiter struck down Phaëthon with a thunderbolt into the Eridanus or Po. His sisters, the Heliades, who had harnessed the horses of the sun, were changed into poplars, and their tears into amber.

PHAËTON. See TROPIC BIRD.

PHAGEDE'NA (Gr., from *phagein*, to eat or corrode) designates a variety of ulceration in which there is much infiltration, and at the same time rapid destruction of the affected part. The sore presents an irregular outline and a yellowish surface; it gives off a profuse bloody or ichorish discharge, and is extremely painful. It usually attacks persons whose constitutions are vitiated by scrofula, by the syphilitic virus, by the abuse of mercury, by intemperance, etc. It not very unfrequently appears in the throat after scarlatina in a severe form. If relief is not afforded by the internal administration of opium (to allay the pain), and of quinia, or some other preparation of bark, wine, beef-tea, etc., to improve the tone of the constitution, together with astringent and sedative

local applications, recourse must be had to the destruction of the part by strong nitric acid, or some other caustic.

The terrible disease known in civil practice as SLOUGHING PHAGEDENA, and in military and naval practice as HOSPITAL GANGRENE, is merely, according to some of our highest surgical authorities, a state of phagedena in its fullest development. This disorder requires for its development the influence of some of those undefined causes which regulate the outbreak of epidemics, and is peculiarly characterized by its contagious and infectious nature. It is usually engendered by the overcrowding of sick and wounded men, and some idea of its virulence may be formed from the fact that on the return of the French fleet from the Crimean war, no less than 60 deaths from it occurred in one ship in the course of 38 hours. It is not of frequent occurrence in the London hospitals; but it broke out in the Middlesex hospital in 1835, in University College hospital in 1844, and in St. Bartholomew's and St. George's hospitals in 1847 (Druitt's *Surgeon's Vade-mecum*, 8th ed. p. 72, *note*). For details respecting this disorder the reader is referred to Hennen's *Principles of Military Surgery*, Boggie *On Hospital Gangrene*, and the article on "gangrene," by Mr. Holmes Coote in Holmes's *System of Surgery*, vol i.

PHALACRO'CORAX. See CORMORANT.

PHALÆ'NA. See MOTH.

PHA'LANGER, or PHALANGIST, *Phalangista*, a genus of marsupial quadrupeds, having a rather short head, short ears, short woolly fur, a long prehensile tail, sometimes completely covered with hair, and sometimes only at the base, and scaly towards the extremity; the dentition somewhat various as to the number of premolars, the incisors always six in the upper jaw and two in the lower, the true molars eight in each jaw, the canines of the lower jaw very small, and close to the incisors. The fore-paws are strong, and capable of much use in grasping food and bringing it to the mouth. A number of species inhabit Australia and the islands to the n. of it. They live chiefly in trees, and feed on insects, small animals of various kinds, eggs, and fruits. The SOOTY PHALANGER or TAPOA (*P. fuliginosa*) is pretty common in Van Diemen's Land, and is much sought after on account of its fur, which is of a uniform smoky-black color, or tinged with chestnut, warm and beautiful. The tail is very bushy. It is nocturnal in its habits.—The VULPINE PHALANGER (*P. vulpina*), also called the VULPINE OPOSSUM, is very plentiful and widely diffused in Australia. The length of the animal from the point of the muzzle to the root of the tail is about 26 in.; the tail is about 15 in. long, and is bushy; the color is grayish-yellow on the upper parts, and tawny-buff below. The fur is not so much valued as that of the last species, but is used for various purposes. The flesh, although it has a strong peculiar flavor, is a favorite food of the Australian aborigines.—Nearly allied to this genus, is the genus *cuscus*, of which one species, whitish-gray, spotted with brown, is plentiful in the Molucca and Papuan islands.—Allied to the phalangers also are the flying phalangers (q.v.).

PHALAN'GIDÆ, a family of trachearian arachnida, popularly called *harvest-men*, some of the species appearing in great numbers in fields during the hay and corn harvests. They resemble spiders in their general form, although their organs of respiration are very different. Their legs are extremely long and slender. Most of the species are very agile.

PHALANSTE'RIANISM (from Gr. signifying phalanx and solid), the system of living in communities called phalansteries, as suggested by Fourier, the French socialist. See FOURIERISM.

PHA'LANX, the ancient Greek formation for heavy infantry, which won for itself a reputation of invincibility, may be described as a line of parallel columns, rendered by its depth and solidity capable of penetrating any line of troops. The oldest phalanx was the Lacedæmonian or Spartan, in which the soldiers stood eight deep; the Athenian phalanx had been the same, until, at the battle of Marathon (480 B.C.) Miltiades reduced the depth to four men in order to increase his front. When Epaminondas organized the Theban army against Sparta, he felt that the Spartan line of battle would be impregnable to troops organized in their own manner. He therefore increased the depth and lessened the front of his phalanx, which enabled him to burst through the Spartan line, inflicting the sanguinary defeat of Leuctra (371 B.C.). Philip of Macedon had learned the art of war under Epaminondas, and when he resolved to make his state a military power, he formed the celebrated Macedonian phalanx (359 B.C.), which enabled him to conquer Greece, and with which his son Alexander subdued the eastern world. The Macedonian phalanx, as the latest form that organization assumed, and as the shape in which the phalanx encountered the military skill of the west, is deserving of description. The line was 16 deep; a grand-phalanx comprising 16,384 *hoplites*, or heavy-armed soldiers, subdivided as follows: the grand-phalanx was composed of four phalanxes or divisions, each under a general officer, called a *phalangarch;* his command was divided into two brigades or *merarchies* (sometimes called *telarchies*), each of these comprising two regiments, or *chiliarchies*, of four battalions or *syntagmata* each. A *syntagma* answered accurately to a modern battalion, except that it was smaller. It was a perfect

square, with 16 men each way, was commanded by a *syntagmatarch* or *xenagos;* and had an adjutant, with one or two other staff officers who stood behind. Eight files united were under a *taxiarch,* four under a *tetrarch,* corresponding probably to a modern capt., two files were under a *dilochite* or subaltern. A single file of 16 men was called a *lochos,* and the best man was placed at its head; a picked man, the *ouragos,* also marching in the rear. The arms of all these phalanx-men were pikes or spears, 24 ft. long, of which 6 ft. were behind and 18 ft. held in front of the combatant. As each man occupied with his shield 3 ft., the phalanx, when it advanced, had six tiers of spear-points in front, a wall of steel which no troops could withstand, especially as the bearers of the spears were pressed on by the ten ranks in their rear. By rapid movements the phalanx could change front, form in close column of syntagmata, and execute other critical maneuvers. —The heavy-armed phalanx was ordinarily flanked by *peltastes* or light infantry, similarly formed, but only eight deep, while the cavalry were but four deep. The phalanx, as representative of the heavy formation, came in contact with the lighter legion of Rome during the wars of Pyrrhus in Italy.—At the great battle of Heraclea (279 B.C.), the phalanx won the day; but the victory was attributable to other causes as much as to any superiority of formation.

PHAL'ARIS, a tyrant of Agrigentum in Sicily, who flourished about the middle of the 6th c. B.C. According to the prevalent tradition, he was infamous for his cruelty. He maintained his power for 16 years by the aid of foreign hirelings, and, it is said, by putting to death all persons of eminence in his dominions; but at last he fell a victim to popular indignation. He gratified, we are told, his love of cruelty by causing persons to be roasted alive in a brazen bull, which was made for that purpose—the first victim being the maker, Perillus. Cicero calls him the "most cruel of all tyrants" (*crudelissimus omnium tyrannorum*). But some doubt attaches to this view of his character, partly because many of the crimes laid to his charge are intrinsically improbable, and partly because later traditions represent him as fond of literature and philosophy, and a patron of learned men. Lucian affirms that he was naturally a man of a mild and humane disposition. How far the later view should be allowed to modify the earlier, it is—in the absence of all reliable knowledge—impossible to say. It is under the later aspect that he is shown to us in the famous but spurious *Epistles of Phalaris.* See BENTLEY.

PHA'LAROPE, *Phalaropus,* a genus of birds of the family *lobipedidæ* (q.v.); having a rather long, slender, weak, straight bill, resembling that of the sandpipers, which, indeed, they otherwise much resemble, although differing in their aquatic habits; the greater part of their time being passed in swimming on the sea, where they seek mollusks and other small marine animals for their food. The GRAY PHALAROPE (*P. lobatus*), although formerly so rare a bird in Britain that Pennant says he only knew of two instances of its occurrence in his time, is now not unfrequently seen in its autumn migration from its northern abode to its southern winter-quarters. It breeds in the arctic regions both of the old and new world, migrating southward in both on the approach of winter. Its entire length is rather more than 8 inches. The tail is short. It is a beautiful bird, and remarkable for the great difference of its summer and winter plumage, the prevailing tint in winter being a delicate gray, whilst in summer the upper parts exhibit a fine mixture of black, white, and yellow, and the breast and under parts are reddish chestnut.—The RED-NECKED PHALAROPE (*P. hyperboreus,* or *lobipes hyperboreus,* a generic distinction being made by Cuvier and others, on account of the sharper and more slender bill), breeds in some of the northern Scottish islands, although it is more common in more northern regions, and, like the former, is found in all the northern parts of the world. It is rather smaller than the gray phalarope, and is, like it, very graceful in form and movements, and finely colored. The phalaropes are very fearless of man, and very easily tamed. Their flesh is oily and unpalatable.

PHAL'LUS, a representation of the male generative organs, used at certain Dionysian festivals in ancient Greece, as a symbol of the powers of procreation. It was an object of common worship throughout the nature-religion of the east, and was called by manifold names, such as linga (q.v.), joni, pollear, etc. Originally it had no other meaning than the allegorical one of that mysterious union between the male and female, which throughout nature seems to be the sole condition of the continuation of the existence of animated beings; but at a later period, more particularly when ancient Rome had become the hot-bed of all natural and unnatural vices, its worship became an intolerable nuisance, and was put down by the senate on account of the more than usual immorality to which it gave rise. Its origin has given rise to much speculation, but no certainty has been arrived at by investigators. The Phenicians traced its introduction into their worship to Adonis, the Egyptians to Osiris, the Phrygians to Attys, the Greeks to Dionysus. The common myth concerning it was the story of some god deprived of his powers of generation—an allusion to the sun, which in autumn loses its fructifying influence. The procession in which it was carried about was called phallagogia, or periphallia, and a certain hymn was sung on that occasion, called the Phallikon Melos. The bearers of the phallus, which generally consisted of red leather, and was attached to an enormous pole, were the Phallophoroi. Phalli were on those occasions worn as

ornaments round the neck, or attached to the body. Aristotle traces the origin of comedy to the ribaldry and the improvised jokes customary on those festivals. Phalli were often attached to statues, and of a prodigious size; sometimes they were even movable. At a procession of Ptolemy Philadelphus, a phallus was carried about made of gold, and 120 yds. long. Before the temple of Venus at Hierapolis there stood two phalli, 180 ft. high, upon which a priest mounted annually, and remained there in prayer for seven days. The phallus was an attribute of Pan, Priapus, and to a certain extent also of Hermes.

PHALLUS, a genus of fungi of the division *gasteromycetes,* egg-shaped, the outer covering at length bursting to permit the growth of a stem, the receptacle which produces the spores, and which is surmounted by a rudimentary *pileus.* The most common British species, *P. impudicus* or *fœtidus,* popularly called *stinkhorn,* is as large as a hen's egg, growing underground in thickets, and finally sending up a stem 4 to 6 in. high, the fetid smell of which is felt for many yards around. The egg is full of a jelly-like substance. The growth of the stem is very rapid, and it soon decays.

PHANARIOTES. See FANARIOTS.

PHANEROG'AMOUS PLANTS (Gr. *phaneros,* manifest; *gamē,* marriage), or PHÆNOGAMOUS (Gr. *phaïno,* to show) PLANTS, are those plants which have true flowers, and in which the sexual organs (stamens and pistils) are distinctly notable. They are also called FLOWERING PLANTS, being by all these names contradistinguished to cryptogamous plants (q.v.). The seeds of phanerogamous plants originate from ovules (q.v.), and already contain the young plant, more or less perfectly formed, which is called the *embryo.* Phanerogamous plants are about three-fourths of all known plants. Among them are included all the larger plants, and all plants of great importance in an economic point of view. They are generally divided into *monocotyledonous* or *endogenous plants,* and *dicotyledonous* or *exogenous plants.*

PHA'RAOH. The name given by the Hebrews to the monarch ruling in Egypt at the time, in the same manner as Cæsar was applied to the Roman emperors, and as Khan is to the Tartar and Shah to the Persian rulers. The word is of uncertain etymology, being capable of two derivations—viz., either *pa ra,* "the sun," which is the leading or first title of all Egyptian monarchs, or the popular expression, *pi ouro,* or *phouro,* "the king." It is even possible to derive it from *pa har,* "the horus," another title of Egyptian monarchs. The greatest difficulties have been encountered in attempting to determine the particular monarchs who pass under this name in the Scriptures. The first-mentioned pharaoh is the one in whose reign Abraham visited Egypt, who is supposed by some chronologists to have been one of the shepherd monarchs, but nothing can be offered beyond mere conjecture in support of this theory. Another pharaoh is the one in whose reign Joseph was brought to Egypt, and who was supposed by Eusebius to be Apophis, one of the later shepherd kings of the 17th dynasty, who are known from the monuments to have immediately preceded the 18th. Bunsen, indeed, places the arrival of Joseph in the reign of Usertesen, or, as he reads his name, Sesertesen I. of the 12th dynasty, in which indeed a famine is stated in the hieroglyphical texts to have happened, and in which it appears numerous officers were established to take charge of the grain. Arguments, however, may be adduced for Joseph having arrived in the time of the 12th dynasty, from the fact of the establishment of the family of Jacob in the land of Goshen, the importance to which Joseph had risen, and the omission of the name of any of the principal Egyptian cities in the narrative, and the fact of Joseph having married Asenath, the daughter of Potipherah, priest of Heliopolis, a city evidently the seat of the court under the 12th dynasty, as Ouar or Avaris was under the shepherds. Equal difficulty is experienced in determining the pharaoh who reduced the Israelites to bondage, employed them in the labors of the brick-field, and compelled them to build the treasure-cities of Pithom and Rameses. He appears to have meditated the total absorption of the Hebrews into the Egyptian race. All that is clear from the narrative is that the city of Rameses was called after his name, in the same manner as modern forts have been by contemporary rulers. Now frequent mention occurs in the papyri and other texts of the *Makatalu en Ramessu,* or Tower of Rameses II., which is represented on the walls of Medinat-Abu; and this has induced Lepsius and Bunsen to depress the date of the exodus from 1491 B.C. to the close of the 19th dynasty, or after Rameses II., a point controverted by other chronologists, who wish to elevate it to the middle of the 18th dynasty, or 1732 B.C. To synchronize the former date, Lepsius takes the rabbinical date of 1314 B.C. for the exodus, or 1340 B.C. for the birth of Moses. The pharaoh of the Exodus is supposed to be Merienptah or Menephthes, the son and successor of Rameses II. Philologically, this explanation is preferable, as the fixed point in the inquiry is the name of the Migdol of Rameses, found both in the Scriptures and on the monuments of Egypt. Other pharaohs are mentioned; as the father of Tahpenes, wife of Hadad and mother of Genubath; the pharaoh whose daughter Solomon married; pharaoh Nechao, or Necho II., who gave battle to Josiah, king of Judah, whom he slew at Megiddo, and who made war against the Syrians, defeated them at Magdolus, and took Cadytus or *Katsh,* on the

Arunata or Orontes. He was subsequently defeated by Nebuchadnezzar at Carchemish, 607 B.C. Pharaoh Hophra, was the Uaphris or Apries of the Greeks, whose destruction was prophesied by Jeremiah, and who was strangled 570 B.C.—Bunsen, *Ægyptens Stelle*, iii. p. 109; Lepsius, *Einleit.* p. 317; Nash, *The Pharaoh of the Exodus* (8vo, Lond. 1862).

PHARISEES (*Perishin* or *Perushim*, Separatists), a so-called "Jewish sect," more correctly, however, a certain Jewish school, which probably dates as a distinct body or party from the time of the Syrian troubles, and whose chief tendency it was to resist all foreign, chiefly Greek, influences that threatened to undermine the sacred religion of their fathers. They most emphatically took their stand upon the law, together with those inferences drawn from its written letter which had, partly from time immemorial, been current as a sacred tradition among the people. Out of the small band of the Chasidim (q.v.), the Pharisees had taken their rise originally as *Chaberim*, friends, colleagues, scholars—in contradistinction to the *Am-Haarez*, or common people—and their chief object in life was the divine law, its study and further development. Principally distinguished by their most scrupulous observance of certain ordinances relating to things clean and unclean, they further adopted among themselves various degrees of purity, the highest of which, however, was scarcely ever reached by any member of their community. For every degree, a special course of instruction, a solemn initiation, and a novitiate was necessary; all of which, together with a certain distinction in dress, seems to have been imitated from them by the Essenes (q.v.). The name of Pharisees or Perushim was probably at first bestowed upon them in derision by the Sadducees or Zadokites, the priestly aristocracy and their party, the Patricians, who differed from them politically, and to some extent also in religious matters. The Pharisees had no special "confession of faith," or articles of creed different from the whole body of Jews. The Bible, as interpreted by the traditional law, was their only code. Obedience to this law, strictest observance of all religious and moral duties, submission to the divine will, full confidence in the wisdom and justice of Providence, firm belief in future reward and punishment, chastity, meekness, and forbearance—these were the doctrines inculcated in their schools. They were, in fact, nothing more or less than the educated part of the people, who saw in the rigid adherence to the ancient religion, such as it had developed itself in the course of centuries, the only means of saving and preserving the commonwealth, notwithstanding all its internal and external troubles. Hence, they wished the public affairs, the state and all its political doings, to be directed and measured by the standard of this same divine law; without any regard for those aristocratic families who ruled, or at all events greatly influenced the commonwealth. These consisted of the priestly families, the Zadokites (Sadducees, q.v.), and of the valiant heroes and sagacious statesmen, who had brought the Syrian wars to a successful issue, and had, by prudent negotiations with other courts, restored the nation to its former greatness, and, on their own part, had acquired wealth and fame, and freer and wider views of life and religion. The latter held the modern doctrine, that religion and state were two totally different things; that God had given man the power of taking his matters into his own hands; and that it was foolish to wait for a supernatural interference, where energy and will were all that were required. Naturally enough, the political difference between the two parties by degrees grew into a religious one, since the Jewish state was one still completely pervaded by the religious element—as indeed it had begun as a theocracy, and could still, to a certain extent, be called by that name. And the more the Sadducees lost their influence—the people siding with the Pharisees—the more the religious gulf must have widened between them; although the divergence between them, as far as our authorities—Josephus, the New Testament, and the Talmud—go, does not seem to have been of a very grave nature. Thus, the Pharisees assumed the dogma of immortality, chiefly with a view to a future reward of good and evil deeds in this world; while the Sadducees, without rejecting—as we are erroneously informed by Josephus—this dogma in the least, yet held that there was nothing in the Scripture to warrant it, and, above all, that there was no need of any future reward; at any rate, that a pious life with a view to this was not meritorious. While the Pharisees held all the traditional ordinances in equal reverence with the Mosaic ones, tracing, in fact, most of the former to Sinai itself, the Sadducees rejected, or rather varied some of these according to the traditions of their own families: these ordinances chiefly relating to priestly and sacrificial observances, certain laws of purity, and some parts of the civil law. It may perhaps even be assumed, with the most recent investigators (chiefly Geiger), that the Pharisees were the representatives of a newer Halacha, dictated by an oppositional and religious and national zeal which carried them far beyond the original boundaries. Certain other legal differences between the two parties, such as the application of the laws of inheritance to daughters, or of the responsibility of the master for his servants, are nothing more than political party-views in a religious mask, which were meant to meet certain special isolated cases only. In general, the Pharisees handled justice in a much milder manner than their antagonists, who took their stand upon the rigid letter, and would hear of no mercy where a violation of the code was clearly made out. Out of the midst of the Pharisees rose the great doctors and masters of the law (*soferim*, scribes; *nomodidaskaloi*, teachers of the law), and to them were intrusted by the later rulers the most important offices.

Until recently the greatest misconception has prevailed, even among scholars, respecting this self-sacrificing, patriotic, pious, learned, and national party of progress. That there were among them those who were a disgrace to any party, and, still more, to their strict one, no one knew better than the Pharisees themselves, and in bitterer words than were ever used by Christ and the apostles, the Talmud castigates certain hyperpious members of their own community as the "plague of Pharisaism." These hypocrites were characteristically styled *Zebuim* [dyed, painted ones], "who do evil deeds like Zimri, and require a godly reward like Phinehas." Seven kinds of Pharisees are enumerated in the Talmud, six of whom were not to be counted as real Pharisees—viz., (1) they who did the will of God for earthly motives; (2) those who made very small steps, or said: Wait for me—I have still some good deed to do; (3) those who knocked their heads against walls, lest they might look at a woman; (4) *ex officio* saints; (5) those who say: tell me of another duty; (6) those who are pious because they fear God. The only genuine Pharisee was he "who did the will of his Father in heaven because he loved him." Josephus's accounts, distortions in themselves, have, to add to the confusion, been misunderstood (thus, for example, the word which he uses to designate the three parties, never meant "sect," as it has invariably been interpreted); and the position of Christ in relation to the Pharisees can never be understood properly without a full acquaintance with the circumstances of the time, to which there is no other way than a knowledge of that literature (the Talmud and Midrash) which has so long been neglected. Christ found the influence of the Pharisees predominant among the people, although the Sadducees (and the Boëthusians) were in reality the ruling classes and allies of the reigning dynasty. He naturally sided with the democratic party of the Pharisees against that of the proud opposite camp. As for the religious tendencies of the latter, the Sadducees (q.v.)—the people had decided that point already practically, by siding with the Pharisees. Once only an allusion is made also to the leaven of Herod = the Sadducees (Mark viii. 15, cf. Matt. xvi. 6). But it was, above all things, necessary to combat the ever-growing tendency to choke up, as it were, all real piety and genuine virtue of heart under external ceremonies and observances, which, unless guarded against, will appear, instead of a mere symbol and memento, the essence of religion itself, and thus become in time a delusion and bondage, and end in that vile hypocrisy against which the Talmud fights with all its powers of derision, and Christ inveighs in much more vehement terms than is his wont. It was not in themselves that these "oral laws" were held up to scorn. They were a necessary and natural growth, and acted, in the main, beneficially; as is now fully recognized by scholars of eminence. (For some further remarks on the subject, see TALMUD.)

Pharisaism—from which gradually branched off the wild democratical party of *zealots* (Kannaim), and which for the last time represented political opinions in the revolution of Bar Cochba—has, from the downfall of the sanctuary, and the final destruction of the commonwealth, to this day remained the principle representative of Judaism as a creed only, Sadduceeism dying out, or, at all events, producing only one such sterile plant as Karaism. See JEWISH SECTS, SADDUCEES.

PHARMACOPŒ'IA. This term has been applied to various works, consisting for the most part of (1) a list of the articles of the materia medica, whether simple or compound, with their characters, and the tests for the determination of their purity; and (2) a collection of approved receipts or prescriptions, together with the processes for articles in the materia medica, obtained by chemical operations. Almost every civilized country of importance has its national pharmacopœia, amongst which those of the United States, France, and Prussia deserve specially honorable notice. The first pharmacopœia published under authority appears to have been that of Nuremberg in the year 1542. A student named Valerius Cordus, who was staying for a short time at Nuremberg, showed a collection of medical receipts, which he had selected from the works of the most eminent writers, to the physicians of that city, who were so struck with its value that they urged him to print it for the benefit of the apothecaries, and obtained for his work the sanction of the senatus. Before this time, the books chiefly in use amongst apothecaries were the treatises: *On Simples* by Avicenna and Serapion; the *Liber Servitoris* of Balchasim ben Aberazerim; the *Antidotarium* of Johannes Damascenus or Mezue, arranged in classes; and the *Antidotarium* of Nicolaus de Salerno, which was arranged alphabetically. This work was commonly called *Nicolaus Magnus*; to distinguish it from an abridgment known as *Nicolaus Parvus*.

Confining our remarks to the British pharmacopœias, we may notice that the first edition of the London pharmacopœia (or, more correctly speaking, of the pharmacopœia of the London college of physicians) appeared in 1618, and was chiefly founded on the works of Mezue and Nicolaus de Salerno. Successive editions appeared in 1627, 1635, 1650, 1697, 1721, 1746, 1787, 1809, 1824, 1836, and 1851; and form an important contribution to the history of the progress of pharmacy and therapeutics during the last two centuries and a half. The nature and the number of the ingredients that entered into the composition of many of the pharmaceutical preparations of the 17th and 18th centuries would equally astonish most of the practitioners and patients of the present day. In the earlier editions we find enumerated earth-worms, snails, wood-lice, frogs, toads, puppy dogs,

foxes ("a fat fox of middle age, if you can get such a one"), the skull of a man who had been hanged, the blood of a cat, the urine and excrements of various animals, etc.; and electuaries were ordered, containing 50, 62, and in one instance—Mathiolus, his great antidote against poison and pestilence—124 different ingredients.

The Edinburgh pharmacopœia is more modern than the London, the first edition having appeared in 1699; while the Dublin pharmacopœia does not date farther back than 1807. The latest editions of these works appeared in the years 1841 and 1850 respectively.

Until the medical act passed in 1858, the right of publishing the pharmacopœias for England, Scotland, and Ireland was vested in the colleges of physicians of London, Edinburgh, and Dublin respectively; and as these three pharmacopœias contained many important preparations, similar in name but totally different in strength (as, for example, dilute hydrocyanic acid, solution of hydrochlorate of morphia, etc.), dangerous complications arose from a London prescription being made up in Edinburgh, or Dublin, or *vice versâ*. By that act it is ordained that "the general [medical] council shall cause to be published, under their direction, a book containing a list of medicines and compounds, and the manner of preparing them, together with the true weights and measures by which they are to be prepared and mixed; and containing such other matter and things relating thereto as the general council shall think fit, to be called *British Pharmacopœia*, which shall for all purposes be deemed to be substituted throughout *Great Britain* and *Ireland*, for the several above-mentioned pharmacopœias."

The *British Pharmacopœia*, of which mention has just been made, a work published in 1864, had the merit of amalgamating the London, Edinburgh, and Dublin pharmacopœias; but it unfortunately contained so many defects, that, in accordance with the universal wishes both of the medical professon and of the chemists, the medical council ordered a new edition to be as speedily as possible prepared. This new edition has met with general favor from the profession; and it is to be hoped that as we have now succeeded in incorporating three distinct works into one, we may, in the course of a few years, hope to have a universal pharmacopœia, or, at all events, one of so general a nature that the most important medicines of the American, British, and chief continental pharmacopœias* shall all be of the same strength. The most important additions to the new edition are benzoated lard (used for making suppositories and ointments), bromide of ammonium (useful for sleeplessness, and in hysteria and epilepsy), carbonate of bismuth and solution of citrate of bismuth and ammonia (useful in the same cases as white bismuth), iodide of cadmium (which may be used in the form of ointment when the yellow color of the skin that follows the application of iodide of lead ointment is objected to), oxalate of cerium (which, in doses of one or two grains, three times daily, acts as a sedative and tonic, and is of great value in chronic intestinal irritation, dyspepsia, pyrosis, in chronic vomiting, and especially in the vomiting during pregnancy), flexile collodion (consisting of a mixture of 48 parts of collodion, 2 of Canada balsam, and of castor oil, and useful as a protecting coating for burns, ulcers, and in erysipelas); glycerines of borax, carbolic acid, gallic acid, tannic acid, and starch (which are used as local applications); various mercurial preparations, as compound ointment of mercury (which is an imitation of Scott's celebrated ointment for diseased joints), mercury suppositories (for thread worms in the rectum), and the black and yellow washes which are now for the first time made officinal, lozenges of chlorate of potash, tincture of pellitory or pyrethrum (used locally for relieving toothache), quinine pills and wine, tincture of sumbl (valuable in 20 minim doses as a nervous stimulant in typhoid fever, delirium tremens, etc.), and tincture of green hellebore, or *Veratrum viride* (which, in doses of from 5 to 20 minims, is useful in gout.

It may be proper here to make the distinction between a pharmacopœia and a dispensatory. These terms have been used indiscriminately, but there is a distinction among pharmacists, which is this: the word pharmacopœia is derived from the Greek and signifies, "I make medicine." It is strictly a collection of recipes or instructions for making various medicinal compounds, or simple preparations, which are also made under the authority of a college or body of medical men, and are termed *officinal*. A dispensatory, is a book which also treats of the preparation of medicines; but it moreover contains the natural as well as the medical history of the various medicinal substances. A dispensatory in addition to officinal preparations, may contain many others, and be published without official authority. A dispensatory is also to a more or less extent a treatise on *materia medica* (q.v.), a branch of medical science which treats of the knowledge and action of medicines, and may either treat of the action of individual medicines or embrace the whole range of the pharmacopœia, and occupy itself with the action of every article, simple, or compound, either upon a healthy or a diseased subject; that is to say, it may consider the physiological as well as the therapeutical action of medicines, therapeutics (q.v.) being that branch of the science which treats of the action of drugs as *medicines* strictly speaking, or their action in disease, for this is often much different from their action on the

*The chief continental pharmacopœias are the French, which is also used in Switzerland; the Prussian, which is mostly used in Germany and Russia; and that of Orosi, which is used in Italy.

healthy body, or their physiological action. A dispensatory is often, nay it is generally, a combination of a pharmacopœia, a materia medica, and a treatise on therapeutics, as far as the latter is not included in materia medica. This depends upon the signification placed upon the word therapeutics. Its original meaning, as derived from the Greek is "I wait upon," or "I attend upon the sick," and includes not only the action of medicines but their *mode of administration* in every respect, as regards time, frequency, or quantity, and the condition in which the patient is to be kept. This, the strict signification of the word therapeutics, is adopted by many, and of course embraces much of the *practice* of medicine. Others regard therapeutics as the science of the action of remedies only, and this is the way in which the word is generally employed. We have thus, for the sake of conciseness, briefly discussed this question under one head. The New York county and New York state medical societies in 1818 took measures for holding a convention of delegates from various state medical societies and medical colleges, which met at Washington Jan. 1, 1820. The action taken then resulted in the appearance the same year of the first *Pharmacopœia* in the United States of America, a volume of 272 pages. The convention made provision for the holding of other conventions for revision every ten years, and such conventions were held in 1830, 1840, and 1850. The convention of 1860 received delegates from the army and navy, and from various colleges of pharmacy and pharmaceutical societies. The first edition of the *United States Dispensatory* was issued in 1831. It has since that time passed through many revisions, and has become double its original size, till at the present time it is really an encyclopædia of therapeutics, pharmacy, and materia medica. Several other excellent pharmacopœias and dispensatories have been published. The American *Pharmacopœia* was first published in both English and Latin, but in 1840, and since that time, the Latin has been omitted. In 1870 several important changes were introduced into it. The terminology of chemical medicines was changed to correspond with the new nomenclature (see CHEMICAL NOMENCLATURE); the substitution of expressions of weight for those of capacity in all formulas, was adopted; and, finally, articles were added relating to the local peculiarities of climate. New preparations are, of course, continually added to the pharmacopœias.

PHAR'MACY (from the Gr. *pharmacon*, a medicine), is that department of *materia medica* (q.v.) which treats of the collection, preparation, preservation, and dispensing of medicines. It is synonymous with *pharmaceutical chemistry*.

PHARNABAZUS, b. Greece 5th c. B.C.; succeeded his father Pharnaces as satrap of the Persian provinces about the Hellespont. He assisted the Spartans in 411 in the capture of Abydos and Lampsacus, protected them after their defeat at Cyzicus in 409, but finally became hostile. In 396 he defeated an invading Spartan force under Agesilaus II., but the next year was defeated by him. Conon came to his assistance from Athens, and they sailed along the Ægæan sea, driving out the Lacedæmonians from the sea-port towns. His last known action was his unsuccessful expedition to Egypt with the Athenian Iphicrates in 377 B.C.

PHA'ROS, a rocky islet off the coast of Egypt, which Alexander the great connected with Alexandria by the Heptastadium, or Seven Furlong Mole. The light-house, at its n.e. point, commenced by Ptolemy I. and finished about 280 B.C., was looked upon as one of the wonders of the world. It seems to have been 400 ft. high, and lasted for 1600 years. The fire, constantly kept lighted on its summit, was said to be visible for 40 miles. The island of Pharos became ultimately a suburb of Alexandria by means of a street extending along the mole. After the time of Julius Cæsar it relapsed into its original condition of a mere fishing station.

PHARSA'LUS, now FERSALA, anciently a t. of Thessaly, to the s. of Larissa, on the river Enipeus, and historically notable for the great battle fought here between Cæsar and Pompey, Aug. 9, 48 B.C. Pompey had about 45,000 legionaries, 7,000 cavalry, and a great number of light-armed auxiliaries. Cæsar had 22,000 legionaries, and 1000 German and Gallic cavalry. The battle, which commenced with an attack on Pompey's left wing, ended in a complete victory for Cæsar. Pharsalus was also one of the positions occupied by the Greeks in the disastrous war against Turkey in 1897.

PHARYNGOBRAN'CHII, a sub-order of dermopterous (q.v.) fishes, characterized by respiratory processes projecting from above the pharynx into the large cavity of the mouth. The pharyngobranchii have no heart, and are the lowest in organization of all fishes. The species are very few. See LANCELET.

PHARYNGOGNA'THI, an order of fishes in the system of Müller and Owen; partly *acanthopterous* and partly *malacopterous* in the system of Cuvier; some of them also *cycloid*, and some *ctenoid*. Their common characteristic is the union of the lower pharyngeals into one bone.

PHAR'YNX (Gr.) is the name of that part of the alimentary canal which lies behind the nose, mouth, and larynx. It is a musculo-membranous sac, situated upon the cervical portion of the vertrebral column, and extending from the base of the skull to the level of the fifth cervical vertebra, where it becomes continuous with the œsophagus (q.v.) Its length is about four inches and a half, it is broader in its transverse than in its

anteroposterior diameter, and its narrowest point is at its termination in the œsophagus. Seven *foramina* or openings communicate with it, viz.: the two *posterior nares* or nostrils, at the upper and front part of the pharynx; the two *Eustachian tubes*, opening on the outer surface of the preceding orifices; the *mouth;* the *larynx;* and the *œsophagus*.

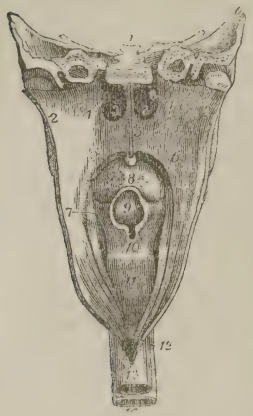

Fig. 1.—The pharynx laid open from behind:

1, a section of the base of the skull; 2, 2, the walls of the pharynx drawn to either side; 3, 3, the posterior nares, separated by the vomer; 4, 4, the extremities of the Eustachian tubes; 5, the soft palate; 6, 6, 7, 7, its posterior and anterior pillars; 8, the root of the tongue; 9, the epiglottis overhanging; 10, the opening of the larynx; 11, the posterior part of the larynx; 12, the opening into the œsophagus, whose external surface is seen at 13; 14, the trachea.—(From Wilson.)

The pharynx is composed of an external *muscular* coat; a middle *fibrous* coat called the *pharyngeal aponeurosis*, thick above where the muscular coat is absent, and gradually thinning as it descends; and a *mucous* coat, continuous with the mucous membrane of the mouth and nostrils. The muscular coat requires special notice. It is composed of a *superior*, *middle*, and *inferior constrictor* muscle on either side, together with two less important muscles, termed the *stylo-pharyngeal* and *palato-pharyngeal* muscles. When the food, after being sufficiently masticated and mixed with saliva, is thrown, by the action of the tongue, into the pharynx, the latter is drawn upwards and dilated in different directions; the elevator muscles (the stylo-pharyngeal and palato-pharyngeal) then relax, and the pharynx descends; and as soon as the morsel is fairly within the sphere of action of the constrictor muscles, they successively contract upon it, and gradually pass it onwards to the œsophagus. Independently of its importance in the act of swallowing, the pharynx exerts an influence on the modulation of the voice, especially in the production of the higher notes.

The pharynx is not so frequently a seat of disease as many other parts of the intestinal tube. In cases of diphtheria (q.v.) it is usually the chief seat of the disease. It is liable to ordinary inflammation or *pharyngitis*—an affection characterized by pain, especially in swallowing, without redness in the fauces or change of voice. Little in the way of treatment, except low diet and attention to the bowels, is required, and the inflammation usually terminates in resolution. Sometimes, however, it proceeds to suppuration, and abcesses—dangerous partly from inanition consequent on inability to take food, but chiefly from suffocation due to pressure on the larynx—are formed. These abscesses are more dangerous in the lower than in the upper part of the pharynx, and are more common in young children than in adults. The treatment consists in opening the abscess, which gives immediate relief; but the operation must be conducted with great care, and the incision made as nearly as possible to the mesial line, in consequence of the large adjacent blood-vessels.

PHASCO'GALÉ, a genus of marsupial quadrupeds, of which one species, *P. penicillata*, about the size of a rat, gray, with long soft hair, and a long tufted tail, is common in most parts of Australia, lives chiefly in the hollows of decayed trees, and preys on small animals of every kind. It is much disliked by the colonists, to whom it is known as the *tapoa tafa*, on account of its depredations in poultry-yards and larders. It is very agile and audacious.

PHASCOLOMY'IDÆ. See Wombats.

PHASE'OLUS. See Kidney-bean.

PHA'SES (Gr. *phasis*, appearance), the different luminous appearances presented by the moon and several of the planets, sometimes the whole, a part, or none, of the luminous surface being seen from the earth. The various phases of the moon, and the reasons for them, are mentioned under the article Moon. Mercury and Venus, being inferior planets, present to an observer on the earth exactly similar phases to those of the moon; but the former require, instead of a month, periods of 116 and 584 days respectively to pass through a complete series of phases. The superior planets, to a certain extent, exhibit phases, but the luminous surface, as seen from the earth, only varies from the full illumination seen when they are in conjunction with the earth to a slightly gibbous appearance, when they attain their greatest elongation; and their distance from the sun is so great in comparison with that of the earth, as to render the variation in the form of their luminous surface not observable, except in the case of Mars and occasionally of Jupiter. Galileo was the first to observe the phases of Venus, and he considered them as one of the most satisfactory proofs of the truth of the Copernican system. The great brilliancy of Mercury, and its nearness to the sun, prevented its phases from being so easily noticed, but they were at last observed by Masius, and since by many other astronomers. The term phases is frequently applied to designate the successive stages of an eclipse, lunar or solar.

PHASIAN'IDÆ, a family of gallinaceous birds, including pheasants, argus, Macartney cock, fowls, impeyans, tragopans, etc.; its limits, however, being extended by some ornithologists to include peacocks and turkeys (*pavonidæ*), which differ from it by no very considerable character. The hind toe is placed higher on the tarsus than the front toes, so that only the tip touches the ground. The wings are short.

PHA'SIS, a river in Colchis, now called the RION. It rises in the mountains of Caucasus, flows in a generally western direction, and enters the Euxine near the ancient city of Phasis.

PHAS'MIDÆ (Gr. *phasma*, a specter), a family of orthopterous insects, allied to *mantidæ*, but differing in having the fore-legs similar to the other legs, and used like them for locomotion, not for combat and prehension, in the want of stemmatic eyes, and in the similarity of the first joint of the thorax to the other joints. They are insects of very extraordinary appearance, inhabiting topical countries, and spending their lives upon trees and shrubs, the tender shoots of which they devour. Some of them resemble green leaves; some resemble brown and withered leaves; whilst others, wingless, or nearly so, and with much elongated bodies—one species nine inches in length—resemble dried twigs. To these peculiarities they owe their safety from enemies, eluding observation, for their motions are sluggish. Some are known as leaf insects, specter insects, walking-sticks, etc. The larvæ of the phasmidæ much resemble the perfect insect.

PHEAS'ANT, *Phasianus*, a genus of gallinaceous birds of the family *phasianidæ;* having a rather short strong bill, a little curved; the cheeks and skin surrounding the eyes destitute of feathers, and warty; the wings short; the tail long, its feathers so placed as to slope down, roof-like, on either side, the middle feathers longest; the tarsus of the male furnished with a spur. The males of all the species are birds of splendid plumage; the females have shorter tails and dull or somber colors. There are numerous species, natives of the warm and temperate parts of Asia. The COMMON PHEASANT (*P. Colchicus*) is said to have been brought from the banks of the Phasis, in Colchis, to the south of Europe, at a very remote period, its introduction being ascribed in classic legend to the Argonauts. From the Phasis it derived its Greek name *phasianos*, the origin of its name in English and other modern languages. It was soon naturalized in Europe, and is now diffused over almost all the temperate parts of it. The date of its introduction into Britain is not known, but was certainly before the end of the 13th c.: it has long been plentiful in plantations and game-preserves, and has been introduced into almost every part of the country suitable to its habits. The abundance of pheasants in Britain, however, is to be ascribed chiefly to careful game-preservation, without which the race would in all probability soon be extirpated. No kind of game falls so easy a prey to the poacher.

A minute description of the common pheasant is unnecessary. The head and neck of the male are steel-blue, reflecting brown, green, and purple in different lights; the back and wings exhibit a fine mixture of orange-red, black, brown, and light yellow; the breast and belly are golden-red, each feather margined with black, and reflecting tints of gold and purple. The whole length of a male pheasant is about 3 ft., of which the tail often measures 2 feet. The entire length of the female is about 2 feet. The general color of the female is pale yellowish-brown, varied with darker brown, the sides of the neck tinged with red and green. The ordinary weight of a pheasant is about 2 pounds and a half; but when pheasants are abundantly supplied with food, and kept undisturbed, they are sometimes 4 pounds or 4 pounds and a half in weight. The pheasant, unlike the partridge, is polygamous.

The nest of the pheasant is on the ground, and is a rude heap of leaves and grasses, in which eleven or twelve olive-brown eggs are laid. But in the half-domesticated state in which it exists in many English preserves, the pheasant does not pay that attention to its eggs and young which it does when more wild, and not unfrequently continues to lay eggs for a considerable time, like the domestic fowl, the eggs being removed by the gamekeeper, and hatched by hens, along with eggs from nests found among clover and hay in the season of mowing. Very young pheasants must be carefully supplied with ants, eggs, maggots, etc., and the whole difficulty of rearing them is in their earliest stage. Pheasants feed very indiscriminately on berries, seeds, roots, young shoots of plants, worms, insects, etc. Beans, pease, corn, and buckwheat are frequently thrown for them in open places in woods; and they scrape up bulbous and tuberous roots in winter. They roost in trees at no great height from the ground, and poachers sometimes capture them by burning sulphur below them. During the molting season, they do not ascend trees to roost, but spend the night on the ground, when they fall a ready prey to foxes. They are fond of woods with a thick undergrowth, in which, when disturbed, they naturally seek shelter, running whilst it is possible, rather than taking flight. The male pheasant takes flight much more readily than the female, which, apparently trusting to her brown color to escape observation, often remains still until the sportsman is almost upon her. The males and females do not associate together except during the breeding season, but small numbers of one sex are often found in company. The "short crow" of the males begins to be heard in March. In England and Scotland pheasant-shooting legally begins on Oct. 1, and ends on Feb. 3. The pheasants turned out from the gamekeeper's breeding-yard into a preserve, are in general supplied with abundance of food

during winter, and come to the accustomed call as readily as any kind of poultry, so that the sportsmanship of a *battue*, in which they are killed by scores or hundreds, is of the lowest kind. It is scarcely necessary to mention that the flesh of the pheasant is in very high esteem for the table.

The female pheasant, in old age, or when from any cause incapable of the functions of reproduction, sometimes assumes the plumage of the male. The pheasant exhibits a remarkable readiness to hybridize with other gallinaceous birds. A hybrid between it and the common fowl is not unfrequent, and is called a *pero*. Hybrids between the pheasant and black grouse have also occurred; and hybrids are supposed to have been produced between the pheasant and guinea-fowl, and the pheasant and turkey. None of these hybrids, however, have ever been known to be fertile, except with one of the original species. On the contrary, the offspring of the common pheasant and the RING-NECKED PHEASANT (*P. torquatus*) is perfectly fertile, a circumstance which is urged in argument by those who regard them as mere varieties of one species. The ring-necked pheasant is now almost as plentiful in Britain as the common pheasant. it is a native of the forests of India and China, and is said not to breed with the common pheasant in a truly wide state, but in Britain they readily intermix. It is distinguished by a white ring almost surrounding the neck, and is of smaller size than the common pheasant, somewhat different in markings, and has a shorter tail.—The BOHEMIAN PHEASANT is another variety of a silvery-gray color.—White pheasants are of not very unfrequent occurrence.—Of other species of pheasant may be mentioned DIARD'S PHEASANT (*P. versicolor*), a native of Java, in which the prevailing color is green; and REEVES'S PHEASANT (*P. Reevesii*), a native of the n. of China, in which white is the prevailing color, and the tail is of extraordinary length, so that a bird not larger than the common pheasant measures 8 ft. in entire length. Of somewhat different type, and more nearly approaching to the common fowl, are the GOLDEN PHEASANT (*P. pictus*, or *thaumalia picta*) and the SILVER PHEASANT (*P.* or *gallophasis nycthemerus*), both natives of China, and both hardy birds, the introduction of which into British preserves has been attempted with good prospect of success. Both have long been kept in a state of domestication by the Chinese. The golden pheasant is one of the most splendid of the tribe. It has a fine crest, and a ruff of orange and black, capable of being erected at pleasure. The tail is very long. The crest and ruff are held in great estimation by anglers for making artificial flies.—LADY AMHERST'S PHEASANT (*P.* or *thaumalia Amherstiæ*) is a native of China, resembling the golden pheasant, and with an extremely long tail.—The silver pheasant is one of the largest and most powerful of the tribe, and very combative, driving the common pheasant from preserves into which it is introduced. The prevailing color of the upper parts and tail of the male is white, finely penciled with black.

PHEASANT-SHELL, *Phasianella*, a genus of gasteropodous mollusks of the family *turbinidæ*, of which the shells are much valued for their beauty, and when they were rare in collections, were sometimes sold for extraordinary prices. They are now comparatively cheap and plentiful, being found in great numbers on some parts of the Australian coast.

PHEIDIAS. See PHIDIAS.

PHELPS, a co. in s.e. central Missouri, watered by Maramee and Gasconade rivers, and Bourbeuse creek, crossed by the St. Louis and San Francisco railroad, about 640 sq. m.; pop. '90, 12,636, chiefly of American birth. The surface is hilly, with many low valleys, and heavily wooded. The soil is fertile. The principal productions are corn, wheat, tobacco, oats, and hay. Iron and lead are found. There are flour, saw, iron, and woolen mills. Co. seat, Rolla.

PHELPS, a co. in s. Nebraska, bounded on the n. by the Platte river; 576 sq.m.; pop. '90, 9869, chiefly of American birth. Co. seat, Holdrege.

PHELPS, ALMIRA (HART LINCOLN); b. Berlin, Conn., 1793; daughter of Samuel Hart, a descendant of the Rev. Thomas Hooker; educated under the direction of her sister Mrs. Emma Willard; became principal of the Sandyhill (N. Y.) seminary for girls. In 1817 she married Simeon Lincoln, editor of the *Connecticut Mirror*. After her husband's death in 1823 she conducted the seminary in Troy, N. Y., jointly with her sister. In 1831 she married the Hon. John Phelps of Vermont. In 1830 she returned to her favorite vocation, and took charge of a seminary at West Chester, Penn., and subsequently taught in Rahway, N. J. In 1841–56 she conducted the Patapsco institute, for 7 years associated with her husband, who died in 1848. She edited the *Patapsco Magazine* and published books on chemistry, geology, and botany for the use of young students, and lectures on the sciences, translations, etc. She d. 1884.

PHELPS, ANSON GREENE, 1781–1853; b. Conn.; removed to Hartford at the age of 18; established himself in the saddlery business, which he had learned. In 1815 he removed to New York, and engaged as a merchant in tin plate and heavy metals. He accumulated a large fortune, partly by investments in real estate, and devoted a large part of his property to benevolent objects. He was president of the blind asylum, the American board of commissioners for foreign missions, and the New York branch of

the colonization society. He bequeathed to religious and charitable institutions $371,000. and entrusted to his son a fund of $100,000, to dispose of in charity.

PHELPS, Austin, d.d., b. Mass., 1820; graduated at the university of Pennsylvania in 1837; studied theology at Andover and New Haven; was pastor of Pine street Congregational church, Boston, 1842–48; became Bartlett professor of sacred rhetoric in Andover theological seminary in 1849, which position he retained until 1879—having retired from full discharge of its duties because of impaired health. He is the author of *The Still Hour; The New Birth;* and was one of the compilers of the *Sabbath Hymn Book.* He was an exceedingly careful writer, a clear thinker, an impressive preacher. His faultless taste in English style, and the deeply devotional spirit of his writings, with his evangelical liberty in theology, gave great value to his training of successive classes of students for the ministry. He died in 1890.

PHELPS, Edward John, ll.d., b. Vt., 1824; educated at Middlebury coll., Vt.; was appointed second controller of the treas. by Pres. Fillmore; practised law in New York, and Burlington, Vt. Originally a whig in politics, he became a democrat prior to the civil war. He was elected president of the American bar association, and was appointed Kent professor of law at Yale college, both in 1881; and was appointed U. S. minister to Great Britain in 1885, and one of the counsel for the United States before the Bering Sea arbitration tribunal in 1892.

PHELPS, Elizabeth Stuart, 1815–52; b. Mass., daughter of Prof. Moses Stuart of Andover theological seminary, and wife of Prof. Austin Phelps of the same institution. She published *The Sunny Side; Peep at Number Five; Tell-Tale; Angel over the Right Shoulder;* and *The Last Leaf from Sunny-Side.* Her literary work, published and unpublished, showed some inheritance of her father's genius.

PHELPS, Elizabeth Stuart; b. Mass. 1844; daughter of Prof. Austin Phelps of Andover. She has published *Ellen's Idol; Up Hill; Tiny; Mercy Gliddon's Work; The Gypsy Series,* 4 vols.; *Tiny's Sunday Night; I Don't Know How; Gates Ajar; Hedged In; Men, Women, and Ghosts; The Silent Partner; The Story of Avis; Beyond the Gates; Dr. Zay; The Madonna of the Tubs; A Singular Life; The Supply at St. Agatha's; Chapters from a Life,* etc. Her books have gained great popularity—*Gates Ajar* reached 20 editions in a year. They show original thought—which does not need to seek the peculiarity of expression which occasionally appears; a sympathy with the perplexed and baffled; keen and quick perceptions, with rapid framing of conclusions; moral earnestness which leads to a certain unusual daring; and a deep longing to solve some intellectual problems and redress some social wrongs which the world has failed to deal with aright. She was married, 1888, to Rev. Herbert D. Ward, in collaboration with whom she published *The Master of the Magicians* (1890), etc.

PHELPS, John Smith, b. Simsbury, Conn., 1814. He graduated at Trinity coll., Conn.; adopted law as a profession, and settled in Springfield, Mo., 1837; was elected to the legislature, 1840, and to Congress, 1844, serving nine consecutive terms. He fought in the union army, and was appointed military governor of Arkansas, 1862. He was elected governor of Missouri by the democrats, 1876. He d. in 1886.

PHELPS, John Wolcott, b. Vt., 1813; graduated at West Point, 1836; received his 2d lieutenant's commission in the 4th artillery and served in Florida, and in Mexico, where he distinguished himself in the battles of Contreras and Churubusco. He was made a member of a board for instruction in heavy artillery practice, and in 1850 was made captain and placed in command at Fort Brown, Texas, where he was instrumental in breaking up the filibustering expedition against Mexico. In 1859 he resigned and became a resident of Brattleboro, Vt. At the outbreak of the civil war he became col. of the 1st Vermont volunteers, was made a brig.gen. of volunteers, and attached to Butler's New Orleans expedition. He resigned in 1862 on account of Gen. Butler's dissatisfaction with his conduct in drilling and enlisting negro soldiers—a policy afterward adopted. He continued to reside in Brattleboro, was an officer of the Vermont Historical society, and wrote *Secret Societies, Ancient and Modern.* He d. 1885.

PHELPS, Moses Stuart, ph.d., 1849–83; b. Andover, Mass.; son of Prof. Austin P., and grandson of Prof. Moses Stuart; graduated at Yale coll., 1869; tutor at Yale, 1873–76; instructor in mental philosophy at Middlebury coll., 1876; went to Germany and studied at the univ. of Berlin, 1876–77, taking the degree of ph.d.; prof. of mental and moral philosophy at Smith coll., Northampton, Mass., from 1878 to the time of his death. His death occurred by accident during his summer vacation.

PHELPS, Oliver, 1749–1809, b. Conn.; engaged in business at Suffield, Conn., and Granville, Mass., and acquired a considerable fortune. In the revolution he held the position of commissary general. In 1788 he and Nathaniel Gorham bought from the state of Massachusetts over 2,000,000 acres of land now comprised in Ontario and Steuben counties, N. Y.; and in 1795 with several associates he bought the tract in Ohio afterward known as the western reserve, including about 3,300,000 acres. His system of land surveys and sales was very complete, and has largely been followed in laying out the public lands. He settled in Canandaigua, was member of congress, 1803–5, and for some years judge of the U. S. circuit court.

PHELPS, WILLIAM WALTER, b. N. Y., 1839; educated at Yale, where he graduated in 1860. He studied law at the Columbia law school; began practice in New York city, and afterward occupied positions of responsibility in several banks and other corporations. In 1872 he was elected a member of the Yale corporation. He was sent to congress from New Jersey in 1873, but failed to receive a re-election in 1875. He was minister to Austria, 1881–82; a representative in congress in 1883–89; U. S. minister to Germany in 1889–93; and a judge of the New Jersey court of errors and appeals from 1893 till his death in 1894. He distinguished himself as an advocate of a protective tariff; and during the campaign of 1884 was one of the stanchest supporters of James G Blaine for president.

PHENICIA (Gr. *Phoinike*, derived either from *phoinos*, purple, or *phoinix*, palm-tree—both designations descriptive of the chief produce of the country; the Hebrew term *kenaan*, lowland, referring to its physical condition) is the name given by the Greeks and Romans to a certain territory situated about 34°—36° n. lat., bounded by the Mediterranean on the w., by Syria to the n. and e., and Judæa to the south. Except where the Mediterranean set a natural boundary, the frontiers differed widely at different periods, n., s., and e., according to the gradual rise and decline of the country. Its length may be said to have been about 200 m., while its breadth never exceeded 20 m., making a total of about 2,000 sq. miles. We may here mention some of the products of the soil, the exportation of which, to a certain extent, laid the foundation of her greatness. Pine, fir, cypress, cedars, terebinths, palm and fig-trees, sycamores, olive-trees, and acacias, crown the heights; while wheat, rye, and barley are found in the lower regions, together not only with ordinary fruit, but also with apricots, peaches, pomegranates, almonds, citrons, sugar-cane, grapes, bananas—all growing luxuriantly, and forming a forest of finely-tinted foliage. The land further yields silk and cotton, indigo and tobacco; and the modern inhabitants of Shur, like their forefathers of old, drive a profitable traffic with the produce of Mount Lebanon, its timber, wood, and charcoal. Flocks of sheep and goats, and innumerable swarms of bees, supply meat, milk, and honey. The sea furnished shoals of fish, and mollusks for the purple of Tyre. There are no precious metals found anywhere in Phenicia; but it is rich in iron, and the stone-quarries of Lebanon were already worked in Solomon's time.

The question of the origin of the Phenicians is one which has hitherto not been solved satisfactorily. Their own account, as preserved by Herodotus, speaks of their having immigrated from the "sea called Erythra;" a report further confirmed by another passage in his history, and by Justin. Strabo speaks of two islands in the Persian gulf, called Tyros or Tylos and Aradus, in which temples were found similar to those of the Phenicians; and the inhabitants of these cities stated that the Phenicians had left them in order to found new colonies. The Erythrean sea, in its widest sense, extends from the eastern shores of Egypt to the western shores of India; and since Genesis calls Canaan, the founder of the race, a descendant of Ham, not of Shem, some investigators have come to the conclusion that the Persian or Arabian gulf is the original home of the Phenicians. Against this notion, however, weighty arguments have been brought forward, both from the genuine traditions of the people itself, as preserved, not in a corrupted Greek shape, but in their myths, in the biblical accounts, in their language, which even in its very oldest remnants (Canaan = lowland; Sidon = fishing-place; Giblites = mountain-people) is purely Semitic. It would be vague to speculate on the time at which the first Phenician settlers entered the country: as vague as to conjecture—the Erythrean sea being put out of the question—whence they came. So much seems certain, that they did not enter it from one region, but from several sides, and at various periods; and that only very gradually, in the course of long pre-historic centuries, they grew into one nationality, embracing the tribes that inhabited the sea-coast, or Phenicia proper, from Sidon to Gaza, and the cities n. of Sidonia. The latter term included the many separate states originally formed by the various *gentes*, who again, originally, had their own political existence, laws, and even worship. Gradually, however, the larger communities extended their rules over the smaller ones, or rather combined with them for the formation of a more imposing and important state, into which the different states were merged, without, however, giving up their own individual existence or cultus entirely. The most important of these special tribes or states were the inhabitants of Sidonia—a term, however, expressive both of the inhabitants of the city and of the whole country—the Tyrians, whose settlement, according to their own traditions, was prior to any other Phenician settlement (about 2,750 B.C.); and Aradus, founded, according to the native traditions, by Arvadi, "the brother of Sidon." From these three tribes—of the Sidonians collectively—are to be distinguished the Giblites with their two sovereignties of Byblus and Berytus, who differed in many respects from the former, and who, it may be presumed, formed at first the ruling state of Phenicia, until they were brought under Sidonian dependency. Several smaller tribes or states are mentioned in scripture—Arke, Sin, Hamath, etc.—but little is known about them.

Of the government and internal constitution of these states or cities, we know next to nothing. There were hereditary monarchs ruling over Sidon, Tyrus, Byblus, Berytus, and Aradus, for whose confirmation, however, the assent of the people was necessary in all cases. By the side of the king stood a powerful assembly, composed of representatives of the old aristocratic families of the land, whose numbers differed at various periods. When Tripolis was founded by Tyrus, Sidon, and Aradus, as a place of joint

meeting for their hegemony, every one of these cities sent 100 senators to watch her special interests at the common meeting; and the senate of Sidon seems, in the 4th c. B.C., at least, to have consisted of 500—600 elders, some of whom were probably selected more for their wealth than for their noble lineage. The king sometimes combined in his person the office of high-priest. The turbulent seething mass of the people, consisting of the poorer families of Phenician descent, the immigrants of neighboring tribes, the strangers, and the whole incongruous mass of workmen, tradespeople, sailors, that must have abounded in a commercial and maritime nation like the Phenicians, and out of whose midst must have arisen at times influential men enough—was governed, as far as we can learn, as "constitutionally" as possible. The unruly spirits were got rid of in Roman fashion somehow in the colonies, or were made silent by important places being intrusted to their care, under strict supervision from home. Only once or twice do we hear of violent popular outbreaks, in consequence of one of which it was mockingly said that Phenicia had lost all her aristocracy, and what existed of Phenicians was of the lowest birth, the offspring of slaves. As the wealth of all the world accumulated more and more in the Phenician ports, luxury, and too great a desire to rest and enjoy their wealth in peace, induced the dauntless old pirates to intrust the guard of their cities to the mariners and mercenary soldiers, to Libyans and Lydians—"they of Persia and of Lud and of Phut," as Ezekiel has it; although the wild resistance which this small territory offered in her single towns to the enormous armies of Assyria, Babylonia, and Greece, shows that the old spirit had not died out.

The sources for the early Phenician history are of the scantiest description. Of the annals and state documents which filled the archives of every large city, nothing has survived except a very doubtful record, which Sanchuniathon (q.v.) is said to have compiled, about 1250 B.C., in Phenician from official documents, and which was translated into Greek by Philo of Byblus, and a fragment of which is preserved by Eusebius. The Bible, principally Ezekiel, Menander of Ephesus, and Dius, a Phenician, who wrote the history of Tyre from Tyrian annals, fragments of which are extant in Josephus and Syncellus, Herodotus, Diodorus, Justinus, and others, together with a very few notes scattered throughout the church fathers, contain the sum of all our information. Four great periods, however, are clearly distinguishable in the history of ancient Phenicia. The first would comprise the earliest beginnings and the gradual development of the single states and tribes, from their immigration to the historical time when Sidon began to take the lead, or about 1500 B.C. The second period dates from the conquest of Palestine by the Hebrews. Sidon had then become already the "first-born of Kanaan," as Genesis has it, or "Sidon Rabbah," the great Sidon. The flourishing state of its commerce and manufactures appears likewise from several passages in Homer. The silver vase proposed by Achilles as a prize in the funeral games in honor of Patroclus, was a work of the "skillful Sidonians;" the garment Hecuba offers as a propitiatory gift to Minerva was the work of Sidonian women. The gold-edged silver bowl given to Telemachus by Menelaos, Hephaistos had received from the king of the Sidonians. Ulysses is left on the island of Ithaca by the Phenicians, who sail away to "well-peopled Sidonia." The gradual ascendency of the rival city of Tyre marks the beginning of the third period, in which Phenicia reaches the height of its power, in which her ships covered all the seas, her commerce embraced the whole known earth, and her innumerable colonies flourished far and near. The first historically-recorded item of Tyre's activity is her foundation of Gades, a few years before that of Utica, in 1100 B.C. The reason of the sudden greatness of Tyre is to be found in the defeat of the Sidonians by the king of "Askalon"—a term probably meant to represent the whole pentapolis of Philistia—about the year 1209; in consequence of which, the principal families of Sidon "emigrated in their ships to Tyre, which (viz., the Island-city) they founded." In the 11th c., in the time of Samuel, "the princes of the Tyrians" are already spoken of instead of the Sidonians, as the representatives of Phenicia. During the reigns of David and Solomon—under Hiram (980–917)—the friendliest relations existed between the two nations, both in the full bloom of their power. Each country needed what the other could supply. Hence their close alliance, which led even to common commercial enterprises in ships built by Solomon, the supercargoes of which belonged to him, while the mariners and pilots were Hiram's.

By this time, Phenician colonization had reached its utmost extent. In the space of three centuries (1300–1000), the Phenicians had covered all the islands and coasts of the Mediterranean with their forts, their factories, and their cities; and their ships, which plowed the main in all directions, everywhere found their own ports. They had colonized Cyprus, thus commanding the waters of the Levant and the coasts of Syria and Cilicia. Kithion, Amathus (Hamath), Karpasia, Paphos, with its magnificent temple of Ashera, Keryneia, and Lapothos, were some of their principal settlements in those regions. Northward, on the coast of Cilicia, they founded the cities of Myriandros, Tarsos, and Soloi. Migrating to the west, they took possession of Rhodes, Crete (cf. the myth of Zeus and Europe), Melos, Thera, Oliaros (near Paros), and Cythera, on the coast of the Peloponnesus. To the east of the Ægean, we find them at Erythræ, and further, as masters of the islands of Samothrace, Lemnos, and Thasos with its wealth of gold mines. The Ægean sea, with all its islands, being in their hands, they sailed thence further west, to Sicily, where they settled at Motye, on the extreme w. point; founded Rus

Melkarth, in the s. (Heraclea Minoa); in the n., Machanath (Panormos, Palermo), and further, Melite (Malta) and Gaulos. They owned Caralis (Cagliari) in Sardinia, Minorca, Iviza (Ebusos), Elba; on the opposite, or African coast, Hippo, Utica, Hadrumetum, Leptis, and some minor island states. From Sardinia and Minorca, the indefatigable mariners went still further w.—through the strait of Gibraltar to Tarshish (the California of those days) or Spain, where they founded Gadeir or Cadiz, and in the s., Karteja, Malaka, and Abdarach. From here, having colonized well-nigh the whole of the Spanish coast, they went northward to the tin islands (Scilly isles), and to Britain herself. And while they thus explored the regions of the Atlantic, their alliance with the Hebrews had permitted them to find the way to the Indies by the Red sea.

The impulse given to industry and the arts by this almost unparalleled extension of their commercial sphere, was enormous. Originally, exporters or traders only for the wares of Egypt and Assyria, they soon began to manufacture these wares themselves, and drew the whole world into their circle of commerce. As to the early and most extensive commercial intercourse between Phenicia and Greece and her colonies, nothing can be more striking than the circumstance of nearly all the Greek names for the principal objects of oriental commerce being Phenician, or rather Semitic—identical almost with the terms found in the Old Testament. Thus, of spices—myrrh, cassia, cinnamon, galbanum, narde, aloe, crocus, nitron, balsam, etc.; of jewels and precious stones—sapphire, jasper, smaragdos; of fine materials, and garments, byssus, karpasos, sindon, etc.; musical instruments—nabla, tympanon, sambyke, etc.; oriental plants, vessels, and even writing implements. The wealth of silver, iron, tin, and lead was chiefly got from Tartessus. The descriptions of the abundance of precious metals there verge on the fabulous. Thus the Phenicians are supposed to have made even their anchors of silver, when they first discovered the country, not knowing how to stow away all the silver in their vessel. What must have been the state of these mines is clear from the fact that, even in the Roman time, 40,000 men were constantly employed as miners, and the state received a clear revenue of 20,500 drachmas daily. The "Fortunate islands," which, according to Diodorus, they discovered after many days' sailing along the coast of Africa, beyond the strait of Hercules, and which to judge from the name Purpurariæ given to some islands off the coast of Mauritania, would seem to have been the Canaries, yielded them the shell-fish purpura, so useful for their dyeing manufactories. Besides their wholesale commerce carried on by fleets and caravans, they also appear to have gone about the interior of Syria and Palestine retailing their home or foreign produce.

Although the Phenicians were erroneously believed, by the western tribes, to manufacture all the wares in which they dealt themselves, yet no inconsiderable number of them was really their own work. None of their manufactures, however, stood in so high repute throughout antiquity as the purple dye prepared from the muricidæ, a shell-fish of its coast; and none excelled more in it than the Tyrians. Purple was an almost indispensable luxury of antiquity, particularly in Asia. In temples and palaces for gods and men, purple garments, hangings, curtains, and veils were needed; and Alexander the great found in Susa alone a store of purple worth 5,000 talents. Sidon's principal production was glass—invented there, it was said, by accident; but probably the invention was derived from Egypt, where it was in use long before; the Phenician glass, however, was always supposed to be the best. The Sidonians knew the use of most of our own contrivances—the blowpipe, the lathe, and the graver. Hardly less great was the fame of Phenician metallurgy. Their mining operations in the Lebanon and Cyprus, where they dug for copper; in Thasos, where, according to Herodotus, they overturned a whole mountain in searching for gold; but more particularly in Iberia, where at first silver was so abundant that hardly any labor was required to obtain it—were stupendous; and the minute description of the mining process contained in Job (chap. xxviii. 1–11) has probably been derived from a sight of Phenician mining-works. That they well understood how to work the metals thus gained, has been observed already. The art of founding brass must, indeed, have reached a high perfection to enable Hiram Abif to execute such works for Solomon's temple as they are described in the Bible. No less were they familiar with the art of imitating precious stones, and coloring glass by means of metallic oxides. To Sidon is further attributed the pre-eminence in the glyptic and plastic arts; and the artists sent by Hiram to Solomon were skillful workers in gold and silver, in brass, in iron, in purple and in blue, in stone and in timber, in fine linen, and the engraving of precious stones. Their architecture seems to have been of a Cyclopean nature. Their vessels, originally simple rafts, gradually developed—with the aid of the Lebanon, which afforded inexhaustible supplies of timber, and Cyprus, which possessed all the materials necessary for fitting up a ship, from the keel to the sails—into a first-rate fleet, consisting of round ships, or gauli, for short or coasting voyages; war-galleys, or triremes; and fifty-oared craft, long in build, and adapted for rapid sailing or rowing. The internal arrangement of these vessels was perfect, and excited the wonder and admiration of the Greeks, by their being so splendidly adapted at once for navigation, freight, and defense. Their extraordinary three years' voyage of discovery, undertaken in the service of Necho, round Africa, going out of the Red sea, and returning by the way of the strait's mouth, is as well known as their voyages in the service of Solomon.

The golden age of Phenicia, during which her colonies, her manufactures, and her commerce were in this most brilliant phase, seems to have waned simultaneously almost

with that of Judea. As Solomon in the latter, so does Hiram in the former, mark the end of that peace and happiness which had made their countries rich and glorious, as no other country of their day. According to a fragment preserved in Menander, Hiram was followed by his son Baleastartus, who died after a short reign of seven years, in 940 B.C., and a long series of political calamities and civil wars ensued. The last of Hiram's sons, Pheletus, fell, in 898, by the hands of Ithobaal, the priest of Astarte, into whose family now passed the kingdom of Tyre. He is the Ethbaal mentioned in Scripture as the father of Jezebel, and father-in-law of Ahab; and a peculiar coincidence is the simultaneous mention of the three years' drought in Judea (to which an end was put by Elijah's prayer) and in Phenicia, where relief was obtained by Ithobaal, who seems to have stood in the odor of sanctity. It was during this unhappy period that the celebrated Elissa, better known as queen Dido (q.v.), fled, together with some of the most aristocratic families of Sidon, to Libya, where they founded a new city (Kartachadata = Carthage), near the spot of an ancient Sidonian settlement, about 813 B.C. The fourth and last period of Phenician history may be dated from the middle of the 8th c., when Shalmaneser, the king of Assyria, invaded Phenicia, and besieged Tyre for five years, but without result; and there is every reason to believe that the peace concluded at the end of this period was very favorable to Tyre. But soon afterwards, Phenicia was drawn into the struggle for the supremacy then raging between Chaldea and Egypt, and was conquered by the former power. A further calamity befell Phenicia at the hand of Pharaoh-Apries, who anticipated Nebuchadnezzar's intended attack on Egypt by destroying the Phenician fleet, conquering the country, and pillaging it. These calamities produced a series of internal troubles, in consequence of which the constitution was constantly changed; and we hear now of a series of kings, and now of provisional *suffetes*—all their respective reigns, however, being of very brief duration. From that time forward, and even before the special histories of Sidon and Tyre, which alternately possessed themselves of the hegemony of Phenicia, constitute also the history of the country itself, and to these two cities we refer for what momentous events took place in the latter days of the once mighty empire. The battle on the Issus terminated even the shadow of Phenicia's independent existence, and it shared the fate of Alexander's vast empire. In 65 B.C. it became, under Roman dominion, part of Syria, and has since shared her fate for good or evil. See SYRIA, SIDON, TYRE, CARTHAGE.

Religion.—With regard to the religion of the Phenicians, its real character has yet been imperfectly expiscated. Deprived of all original and direct information on the subject, we have to cull what scanty notices we may from the works of Greek and Latin writers, or to gather knowledge from some vague allusions contained in the Bible. Not a scrap of native literature has been allowed to survive; and the supposed extracts from a Greek version by Philo of Sanchuniatho's Phenician works, which we find in Eusebius—hitherto our chief source of information—must be used with more than an ordinary degree of caution. See SANCHUNIATHON. We shall, therefore, without entering into futile speculations, confine ourselves to a few general and well-ascertained facts; premising, however, that Phenician theology is far from being a hopeless province, whatever it may appear now. Excavations are on foot in all directions, both in the mother-country and in the colonies, and new discoveries are being brought to light constantly.

The religion of the Phenicians was, like all ancient Semitic religions—except that of the Hebrews—a kind of pantheistic worship of nature. While monotheism, with the descendants of Abraham, assumed a supreme power within nature, which, according to its own free will, creates and destroys, the rest of the east assumed a dualism: two elements, a male and female; or two highest deities, one of whom begets, and has the power to destroy, and the other conceives and bears. These two supreme beings were sometimes merged in one deity, with male and female attributes, which spread out into immense ramifications: representatives now of the general powers of nature, now of the particular phenomena in nature, or the life of men. They had deities who ruled over the stars, the elements, the seasons; over special localities, or over certain phases of life. No nation of antiquity perhaps possessed a more endless pantheon than the Phenicians: a circumstance easily explained by their peculiar position and relations. Consisting originally of a variety of tribes, each of whom had had their own special deities—although the supreme *numen*, or the principle of their chief deity, was probably the same with all—those Phenicians who dwelt in the n. differed in some respects, such as the names and attributes of certain gods, from those of the south. Besides this, it must not be forgotten that the period of Phenician history ranges over 2,000 years, and their political career, as well as their commerce, brought them in close and constant contact with nearly all the civilized nations of the then known world; and being both superstitious (as sailors and traders are prone to be), and possessed of an adaptibility to which partly they owed their success in other respects, they easily, if not greedily, received into their wide pantheon those who, albeit the special national gods of others, or because of this very reason, could either harm or benefit them. It may be also that a certain easy nonchalance about these things, such as the wealthy and aristocratic classes displayed in ancient Rome and elsewhere, and the interests of the priests, who received very considerable tithes of every sacrifice (oddly enough our information on that point leaves nothing to be desired), went hand in hand to favor the gradual introduction of as many gods and goddesses as pleased the herd. Their proper divisions, however, their real names and

derivations, and the history and time of their nationalization, are things which will forever continue to puzzle investigators.

Setting aside such more or less vague and undefined names of deities as were common to the whole Semitic stock, and as they are found in the Hebrew records—like *El* (mighty one), or (in plural) *Elim; Ollonim* [*Elyon*] (the most high); *Adon* (lord); *Melech* [*Moloch*] (king); etc.—we find in the first rank of gods (of Tyre and Sidon) Baal (q.v.) and Astarte (q.v.). Baal again occurs in two different characters, as it were—as *Baalsamin* (lord of heavens), the highest god ruling over the universe, the Zeus Olympios, and Jupiter Optimus Maximus; and as *Baal Melkarth*, the special national numen. Baalsamin is originally identical with the Babylonian Bel or Baal. The third supreme Tyrian goddess was Astarte, worshiped as the very counterpart of the Sidonian *Astarte*. While the latter was considered a pure virgin, whose emblem was the moon, the former (the biblical Ashera) was propitiated (as Venus, goddess and planet) by prostitution. The Tyrian Astarte was principally known under the name of Tanis (q.v.), the Assyro-Persian Tanais, and was married to Baalsamin, and also to Adonis, and bore altogether the character of a goddess who delighted in chastity.

The principal deities of northern Phenicia—the non-Sidonian tribes—consisted of a different trias—*El, Baaltis*, and *Adonis*. The first was the supposed founder of the two oldest Phenician cities of Byblus and Berytus, and corresponded to (being originally, perhaps, identical with) both Baalsamin, as the highest deity, and Melkarth, as the special god of Tyre. Baaltis, Beltis (my lady—Aphrodite), worshiped at Byblus, Berytus, Aphaka, Arke (Architis), etc., was joined to Adonis (q.v.), whose cultus had been imported from Assyria, and is therefore unknown in the more ancient Phenician colonies, in Africa and Spain. Byblus called him Adonis Ganas, or Ganan (perhaps Gaavan, the exalted); near Byblus, we find him worshiped as Elyon (the highest); as Esmun in Bertyus, and perhaps also under the name of Memnon, at Apamea, where an annual morning-festival was celebrated in his honor; further, near the river Bandas at Paltos; and at the river Belus. As Serach (the brilliant) in Phenician, and Kharush (the sun) in Persian, he appears to have had some relation to the star-and-planet worship which became, under Assyrian influence, a prominent feature of the Phenician religion.

Besides these more or less localized gods and goddesses (*dii majores*), a certain number of deities—states and country deities—were worshiped in common by all Phenician states. They were called the children of Sadik (the just), or the Children, or the Patæki (descendants of Phtha), or the eight Kabiri (strong ones). They are the maritime gods, and their images were placed on the prows of Phenician ships. As protectors of navigation they are identified with the Dioscuri; and again as representatives of heat, breath, and life, they received the names of Lares and Penates. Their individual names are not generally mentioned; they seem (cf. Emun = eighth) to have been merely counted. Their mode of worship was most mysterious—as indeed some of the earliest mysteries were closely connected with it.

Besides these they also worshiped certain phenomena, personified attributes, and qualities. Their planetary divinities were the Sun and his four horses—to whose worship belongs, among others, to a certain extent the annual festival of the resurrection of the (Tyrian) Herakles, under the emblem of a column in the form of a rising flame (Chaman); the Moon with her chariot drawn by white bulls; the planet Mars (Aziz or Nergal); Jupiter (Kochab Baal); Venus (Astoret Naamah = lovely Astarte), with her voluptuous cultus; and Saturnus (Moloch, Kronos), the evil principle. The elements were revered either in conjunction with certain deities or on their own account. The water, to which sacrifices were offered, both in the shape of human beings and animals or fruits, was haliowed in all its shapes—as the sea, as rivers, fountains, lakes—by which people took their most solemn oaths; the fire, in connection with the oldest deity of Phenicia; the light (Moloch); the air and the winds; the earth and all its plants, its forests, and glens, and trees, and more especially its mountains, as the "symbols of the high ones," or as "faces of God," such as mount Carmel, Lebanon, Antilibanus, and others. Of animal-worship we have only small traces.

Abstract notions and ideas were not forgotten. The year and the months, day and night, Aurora (Lilith), age and youth, art and love, had their altars. Nor were certain professions and trades without their visible patrons. Thus, there are gods of agriculture and horticulture, like Dagon, the god of grain; a Dionysos, whose Phenician name is lost, as the god of wine-growers; a god who is the numen of fruit-growing, of pisciculture, of mines, etc. Chthonian gods are not wanting. The god of death—the king of the lower regions—is Muth = Death (Pluto), who is represented as a small child. His name was shared by a goddess whose name is vaguely known as Eloti (my goddess), and who is occasionally identified with Astarte, Dido, Anna, Persephone, Europa, and a great many other deities.

We have already touched upon the mode of worship of the Phenicians, and the places chiefly selected for their rites. Mountains, heights, rivers, lakes, fountains, meadows, glens, were, as we said, the favorite habitations of the gods. But the Phenicians were also amongst the first who erected temples. These were generally divided in two parts, containing the sacred arks (the mystic cists of the Greeks); and the chariots upon which the sacred objects were at times carried about. Not being intended to be prayer-houses, but as dwelling-places for special gods, they were rather small, and did

not even contain the altar upon which the sacrifices were offered. This generally stood at the entrance of the temple, and around it the priests and hierodouloi danced in their service. Pure wells and an everlasting fire were the indispensable conditions of a sanctuary. The sacrifices themselves, as far as they consisted of animals, offer great analogies to those of the Jews; but the Phenicians also offered up human sacrifices—chiefly first-born male children, as that which the suppliant held dearest—chiefly to Baalsamin, Baal Hamon, and Astarte. Such human sacrifices, or burnt-offerings took place annually at the great festivals of expiation, and further on extraordinary occasions, at the beginning of important enterprises, such as a campaign and in great casualties: in order to expiate by one sacrifice the sin of all. The same fanaticism which fancied the gods best pleased by the offering up of what was most precious, led the Phenician women, like the Babylonian, to sacrifice their honor in honor of Astarte, on certain occasions, so that certain sanctuaries became hot-beds of prostitution. Circumcision—another kind of sacrifice—was not common among all the Phenician tribes, it being a rite principally sacred to El, the god of Berytus and Byblus.

Of festivals and pilgrimages in general, we have spoken under FESTIVALS, GREEK RELIGION, etc.; and what has been observed there respecting their character in Polytheism (their being to a great extent connected with the births, deaths, resurrections, and other personal phases of special deities), holds good here. No doubt, these festivals, like those of the Hebrews, and all other ancient nations, had, beside their religious, also their political and commercial significance; and Phenicia was more particularly, by the eminent position she held in the world's trade, a place towards which flocked, on solemn occasions, pilgrims from all parts of Asia and Africa. "Festival embassies," as they were called, were dispatched thither from Syria, Arabia, Babylonia, Cappadocia, Cilicia, Egypt, Armenia; nay, from India, Ethiopia, Persia, and Scythia; and not until the 5th c. A.D. did these pilgrimages to Phenicia cease entirely. One festival is entirely peculiar to Tyre, and strangely enough it is still celebrated by the present inhabitants of Sur—viz., the "wedding of the land-water with the sea-water." On these occasions, the people walk in procession to the well near the town-gate, and pour some pails of sea-water into it, in order to render it clear and sweet again for a long time.

It would be vain to try, with our scanty and adulterated sources, to gain a deeper insight into the ideas attached to the names, attributes, and modes of worship of the deities mentioned, or to speculate upon their moral influence upon the people of Phenicia. That these were pre-eminently practical; that arts and manufactures flourished among them, more than among any other ancient nation; that they knew how to turn science into money; that they were, in fact, shrewd men of business—all this we know, but little more. Atheists or pantheists, whichever they must be called in the modern sense of these words, it is extremely doubtful whether they, any more than the bulk of the Hebrews before the exile, believed, as a body, in immortality. What was their influence upon Greece, Rome, the whole ancient and modern world, in the province of religious thought, we shall never have any means fully to ascertain. Comparative mythology has a vast field to explore in this direction.

Phenician Language and Literature.—With the exception of Greek and Latin, no language was so widely known and spoken throughout antiquity as the Phenician; and monuments of it have been found, and continue to be found, almost all over the ancient world. We can only vaguely speculate on its early history and its various phases, so long as our materials yield so little information on that point. Its decline seems to date from the 8th c. B.C., when Aramaisms crept in in overwhelming numbers. Finally, the close contact with, and the everywhere preponderating influence of the Greeks, superseded—chiefly after Alexander's time—the ancient language almost completely; and even coins with Phenician legends occur not later than the 2d c. B.C.—An important Phenician literature seems to have been extant as late as the 1st c. A.D., but it has disappeared from the face of the earth. After the second half of the 3d c., the language had vanished entirely in the country itself, and Jerome, who lived in Palestine, mentions the Punic, but never the Phenician. In the west, it survived to a much later period. In Mauritania and Numidia, it remained, in a corrupted form, the reigning tongue as late as the 4th c. A.D.; and Augustine draws his explanations of Scripture from the Punic current in the 5th century. There was a translation of the whole Bible into Punic made for the use of the Punic churches; and in and near Tripolis and Bizanium, it was the language of the common people up to a late period. From the 6th c., however, it rapidly died out, chiefly in consequence of the Vandals, Goths, Moors, and other foreign tribes overrunning the country, and ingrafting their own idioms upon it.

As a branch of the so-called Semitic family of the Hebrews, Syrians, Arabs, etc., the Phenicians naturally are closely related to these also with respect to language. The affinity of the "speech of Canaan," as the Hebrew is called sometimes, with the Phenician was indeed remarked at an early period. Augustine, Jerome, and Priscian pointed out already—and sometimes in order to back some very peculiar notions—how closely these two languages and their dialects were allied. Yet it must be obvious at first sight, that however near the two idioms may originally have stood to each other, the peculiar relations and fortunes of the two races who spoke them must have produced substantial changes in their structures in the course of time. While the ancient scriptural monuments of the Hebrews—outwardly and inwardly—exhibit a rare unity of idiom and form,

the ancient hallowed utterance becoming a type and model for the later generations: the Phenecians, on the other hand, not confined within the narrow limits of their home-country, but mixing freely with all the nations of the earth, spreading their own colonies far and near among them, opened a wide field for the "development" of their language, or rather for its corruption, by its entering into alliance with Libyan in Africa, Sardinia, and Spain, and with Aramaic in northern Phenicia, Cilicia, and perhaps even in Cyprus. Thus it came to pass that the two languages which originally may have been identical in old Canaan became more and more widely divergent. To enter into a more detailed disquisition on this or other cognate points, we deem more hazardous now than we should have thought it only a very few years ago; for the more ample our discoveries in Phenician literature have become of late, the more it becomes evident that we are only at the commencement, as it were, of Phenician philology.

What we said of the structure of the Hebrew language (see JEWS) holds good for Phenician to a certain extent; and we shall therefore simply point out the most palpable differences between them. In the first instance, we observe the very strange circumstance, that what is considered an archaism or an isolated dictum in Hebrew, appears as a common expression in Phenician. Certain grammatical terminations, obsolete in Hebrew, are in use in Phenician—so that it would appear as if the Phenician had retained more of the ancient Canaanite speech than the Hebrew, which gradually transformed and refined it by grammatical niceties. Another feature is the preponderance of the Chaldee, or rather Aramaic words and forms—although here again we are on very dubious ground. It might further be questioned whether our Phenician inscriptions—all belonging to a very late period—are not rather a faithful reflection of the Hebrew of their period, which, since the 8th c. B.C., had more and more changed into Aramaic. So much is certain, that the original language of Canaan was perfectly free from Chaldaisms, and that these are but a late corruption—such as we also find in the later books of the Old Testament. Yet there are other features quite peculiar to the Phenician, which—although not of sufficient importance to warrant our separating the dialect entirely from the Hebrews—are of a nature not to be explained by any Semitic analogy; such as certain differences in the pronunciation of vowels, in the treatment of consonants, the formation of pronouns, some verbal forms, and certain words entirely foreign to the Semitic. Again, a distinction is to be made between the Phenician of Phenicia and that corrupted form of it spoken in the western colonies, called Punic, and further, that idiom peculiar to the inhabitants of Leptis, called Libyo-Phenician—a mixture of Phenician and Libyan, with a vast preponderance, however, of the former element.

The difference in the pronunciation may be briefly characterized as a tendency towards an obscuring or lowering, as it were, of the vowels: thus, the Hebrew *a* is changed into *o*, the *e* into *i* or *y*, *i* into *y*, sometimes into *u*, and *o* into *u*. Peculiar is also the use of the Hebrew *Ayin* as a vowel (*mater lectionis*), with the pronunciation of *o* or *u*. On some occasions, however, it is entirely omitted. The gutturals are changed at times, as in the corrupted orthography of Samaritan and Sabian, so that *L* and *R* are sometimes assimilated with the next consonant in the middle of the word, or entirely omitted, etc. As to grammar, our knowledge is extremely limited. A few undoubted facts are the termination of the nominative form in *at* instead of the Hebrew *ah*, the greater variety of genitive forms in Phenician, the difference in the formation of the pronoun, and the identity of the article with that in Hebrew (*ha*). For the Phenician alphabet, the model of all European alphabets, see ALPHABET.

The literature of Phenicia, in its original form, has, as we said, perished entirely. What traces and fragments we have of it, have survived in Greek translations. But from even these small remnants, we can easily imagine the extreme antiquity, and the high importance and vast extent of these productions, which, at first, seem to have been chiefly of a theological or theogonical nature. Their authors are the gods themselves, and the writings are only accessible to the priests, and to those initiated in the mysteries. From the allegorical explanations of these exalted personages sprang a new branch of sacred literature, of which those fragments of cosmogony mentioned above are derived. To the literary age of Taaut, Kadmus, Ophion, Esmun, etc., succeeded Thabion, Isiris, Sanchuniatho, and Mochus, who founded the schools of priests and prophets. These cultivated the sciences, chiefly the occult ones, magic, and the like. Nearest to the sacred literature stands didactic poetry, somewhat related to the Orphic, whose chief representatives are Sido, Jopas, etc. The erotic poetry is characterized as of a very sensuous nature, both in Phenicia and the colonies. Of historians are mentioned Mochus, Hypsikrates (Sanchuniatho ?), Theodotus, Philostratus, Menander, and others; but these are mere Greek versions of their Phenician names, and absolutely nothing has been preserved of their writings. Punic literature is also frequently mentioned by Greek and Roman writers. Geography, history, agriculture, were the fields chiefly cultivated by the colonists of Carthage and the west generally.

The monuments that have come down to us, and which not only have enabled us to judge for ourselves of the religion, the language, and the manners of the Phenicians, are of twofold kind—they are either legends on coins and lapidary inscriptions, or Phenician proper nouns and texts imbedded in the works of ancient classical, or sacred writers. The principal and ever-growing source for our information, however, are the monumental inscriptions, of whose existence, till the middle of the 18th c., nothing was

known. The most numerous Phenician remnants have been discovered in the colonies. Richard Pococke first found, on the site of ancient Citium (Larnaka of to-day), 31 (not 33, as generally stated) Phenician inscriptions, which he deposited at Oxford (published by Swinton, 1750). Malta, Sardinia, Carthage, Algiers, Tripolis, Athens, Marseilles, have each yielded a considerable number, so that altogether we are now in the possession of about 120 monuments, either votive tablets or tomb inscriptions. The latest and most remarkable are those now in the British museum, discovered at Carthage a few years ago by N. Davis, consisting of votive tablets, a (doubtful) tombstone, and a sacrificial tariff, which completes another stone found some years ago at Marseilles of the same nature; both setting forth the amount of taxes, or rather the proportionate share the priest was entitled to receive for each sacrifice. Another exceedingly valuable (trilingual) inscription, referring to the gift of an altar vowed to Eshmun-Asklepios, has been discovered quite recently in Sardinia. See below. One of the most important historical monuments is the sarcophagus of Ashmanasar II., king of Sidon (son of Tennes?), found at Tyre in 1855, the age of which has variously been conjectured between the 11th c. B.C. (Ewald)—a most incongruous guess indeed—the 7th (Hitzig), the 6th (Duc de Luynes), and the 4th (Levy), of which we shall add the commencement, literally translated: "In the month of Bul, in the 14th year that I reigned, king Ashmanasar, king of the Sidonians, son of king Tebnith, king of the Sidonians—spake king Ashmanasar, king of the Sidonians, saying: Carried away before my time, in the flood of days—in dumbness ceases the son of gods. Dead do I lie in this tomb, in the grave, on the place which I have built. I myself ordain that all the nobles and all the people shall not open this place of rest; they shall not seek for treasures and not carry away the sarcophagus of my resting-place, and not disturb me by mounting the couch of my slumbers. If people should speak to thee [and persuade thee to the contrary], do not listen to them. For all the nobles and all the people who shall open this sarcophagus of the place of rest, or carry away the sarcophagus of my couch, or disturb me upon this resting-place, may they find no rest with the departed; may they not be buried in a tomb, and may no son and successor live after them in their place;" etc.

i.e., Lerabbath Letanith Pen-Baal Uleaddan Lebaâl Ch[ammon A]
[Sh] Nadar Chanbaâl [Ben Abd] Ashmun . . . . [Shema] [Ko]l[a Barcha . . . . . "To the Lady Tanith, the Face of Baal, and to the Lord Baal Chammon [is dedicated this *scil*] which has vowed Hanbaâl [the son of Abd] Ashmun . . . . [When he (or she) hears his voice, may he (or she) bless."]

The votive tablets bear the same character throughout, differing only with respect to the name of the man or woman who placed it in a certain sanctuary in accordance with his or her vow. Their material is mostly limestone or fine sandstone, rarely marble, and they vary from 5 to 15 in. in height, from 4 to 7 in width, and from 1½ to 4 in thickness. Beginning in most cases with the dedication to the god or goddess, or both, thus: "[Sacred] To the god . . . . [this tablet] which vowed N. son (daughter) of N. When he (she) heard my voice and blessed," or "hear my voice and bless;" etc. The sepulchral tablets generally run somewhat in this manner: "Stone erected to . . . . , who lived . . . . years."—Much yet remains to be done. Even the paleographical side has, notwithstanding all the ready material, not been settled satisfactorily yet. One point, however, is indisputable even now. There are at least two kinds of Phenician writing to be distinguished most clearly. The older, purer, more orthographical, and more neatly executed is found in the inscriptions of Phenicia herself, of Malta, Athens, Citium, and Carthage; the younger, corrupted not only with respect to the grammar and language, but also with respect to the form of the letters, which are less carefully executed, and even exhibit some strange, probably degenerate, characters, is found chiefly on the monuments of Cyprus, Cilicia, Sardinia, Africa, Spain, Numidia, and the adjacent parts. See MOABITE STONE.

Besides these monumental sources for the language, there are a few remnants of it imbedded, as we said, in ancient non-Phenician writings. The Old Testament alone, however, has preserved its words—proper nouns chiefly—unmutilated. Later eastern writers even, not to mention the Greeks and Romans, have corrupted the spelling to such a degree that it is often most puzzling to trace the original Semitic words. Phenician names occur in Suidas, Dioscorides, Apuleius, in martyrologies, calendariums, acts of councils, in church fathers (Augustine, Priscianus, Servus), etc. The only really important remnant, however, is found preserved—albeit fearfully mutilated and Latinized—in Plautus's *Pœnulus*, act v. s. 1 of which contains, in 16 lines, the Phenician translation of the Latin text, with more than 100 Phenician words. Several other phrases and

words are embodied in act v. ss. 2 and 3 of the same play. Yet, although there is very little doubt among scholars about the greater portion of these texts, the corruption and mutilation which they had to undergo, first at the hands of Plautus, who probably only wrote them by the ear, then at the hands of generations of ignorant scribes, have made more than one word or passage an insoluble puzzle.

The specimen of Phenician [Punic] writing subjoined is taken from one of those Carthaginian votive tablets with which the British museum (now the wealthiest in Phenician monuments) has lately been enriched, as mentioned before.

The emblems on it are symbolical, and refer to the deities invoked. The lower part is mutilated, but easily supplied. The date is uncertain, perhaps the 2d or 3d c. B.C.

A trilingual inscription from a base of an altar, found at Pauli Gerrei, in Sardinia, was first fully explained by Deutsch. (See *Transactions* of the royal society of literature, 1864.)

Its contents are briefly this: A certain Cleon, Phenician by religion, Greek by name, Roman by nationality, a salt-farmer, vows an altar—material and weight of which are only given in Phenician; viz., copper, 100 lbs.—to Eshmun-Æsculapius "the healer" (the Phenician *mearrach*, clumsily transcribed *merre* in Latin, and *mirre* in Greek), in consideration for a cure to be performed. The date, given in Phenician, viz., the year of two, apparently annual, entirely unknown judges, gives no clue to the time. Paleographical reasons, however, would place it in about the 1st c. B.C.

Among those who have more or less successfully occupied themselves with Phenician antiquities, language, and literature, and who have also, in some instances, deciphered inscriptions, we mention Scaliger, Bochart, Pococke, Barthelemy, Swinton, Bayer, Dutens, Hamaker, Gesenius, Movers, Munck, Judas, Bargès, De Saulcy, Ewald, Levy, Vaux, Renan, De Luynes, De Vogué, Deutsch, and others; to whose writings, contained either in special works or scattered in transactions of learned societies, we refer for further information on the subject of our article. The principal work in German is Movers's *Phenizier*, unfortunately left unfinished at the author's death. A useful English compilation is Kenrick's *Phenicia* (Lond. 1855).

PHENICINE, or PHENYL BROWN, a rich dye, first prepared by Roth in 1865 by the action of nitro-sulphuric acid on carbolic acid or phenol. It is a brown, amorphous powder, very soluble in alcohol, ether, and acetic acid, slightly soluble in water. It consists of two coloring matters, one yellow, the other a black, humus-like body. It dyes silks and woolens without the aid of mordants. Silk which has been dyed with it, if treated with chromate of copper to which a small amount of sulphuric acid has been added, turns to a garnet red, and nitrate of copper produces a similar though not so intense an effect. Cotton may be dyed a deep purple by first immersing it in a solution of tannin, or of stannate of soda, as a mordant, and then in a solution of phenicine, and subsequently in a hot solution of chromate of potash. The color, however, is unstable.

PHE'NIX, the name of a mythical Egyptian bird, supposed by some to be a kind of plover, like the *kibitz*, often depicted with human arms, and called in hieroglyphs *rekh*. Others consider to be the *bennu*, or nycticorax, a bird sacred to Osiris, and represented watching the tamarisks over his coffin. The first of these representations has sometimes a star upon the head, supposed to indicate the astronomical period of its appearance. It visited Egypt after the death of its father, and entered the shrine particularly dedicated to it at Heliopolis, and there buried its parent, putting the body into an egg or case made of myrrh, and then closing up the egg. Another account is, that the phenix when about to die, made a nest for itself in Arabia, from which a new phenix sprung of itself. This bird proceeded to Heliopolis, and there burned and buried its father. But the more popularly known version is, that the phenix burned itself, and a new and young phenix sprung from the ashes. A less received version is, that a worm crawled out of the body of the dead phenix, and became the future one. The phenix was, according to the most authenic accounts, supposed to visit Egypt every 500 years; the precise period, however, was not known at Heliopolis, and was a subject of contention till its appearance. The connection of the phenix period with that of the Sothiac cycle, appears to be generally received by chronologists, as well as the statement of Herrepollo, that it designated the soul and the inundation of the Nile. A great difference of opinion has prevailed about the Phenix period: according to Ælian, it was a cycle of 500 years; Tactitus seems to make it one of 250 years; Lepsius a cycle of 1,500 years. The phenix was fabled to have four times appeared in Egypt: 1, under Sesostris; 2, under Amasis, 569–525 B.C.; 3, under Ptolemy Philadelphus, 284–246 B.C.; and lastly, 34 or 36 A.D., just prior to the death of Tiberius. The phenix also appears upon the coins of Constantine, 334 A.D. viz., 300 years after the death of Christ, who was considered the phenix by the monastic writers. It is supposed by the rabbins to be mentioned in Job and the Psalms.—Job. xxxix. 18; Psalms ciii. 5; Herodotus, ii. 73; Achilles Tatius, iii. 25; Tacitus. *An.* vi. 28; Tselzes, *Chil.* v, 397; Lepsius, *Einleit*, p. 183; *Archæologia*, vol xxx. p. 256.

PHENOL, PHENIC ACID. See CARBOLIC ACID.

PHENOM'ENON (Gr. appearance), the name given in philosophy to an object or fact as it is perceived by us, as distinguished from what it is in itself. In the philosophy of

Kant, that, whatever it may be, which is behind the phenomenon, and causes it, is called the *noumenon*, as being merely assumed or thought of in the mind. See METAPHYSICS, PERCEPTION.

PHE'NYL, AND THE PHENYL'IC GROUP. Phenyl, C_6H_5, is an organic radical, which has not yet been isolated. Its most important compounds are: (1.) carbolic or phenic acid, $C_6H_5 \cdot OH$, known also as phenol, phenyl hydrate, and phenyl-alcohol. See CARBOLIC ACID. (2.) Phenyl hydride, C_6H_6, known also as benzole, benzene, and phene. See BENZOLE. (3.) Phenylamine or phenylia, $C_6H_5 \cdot NH_2$, or C_6H_7N, better known under the name of aniline, one of the most important of the artificially formed bases.

Aniline derives its name from *anil*, an obsolete name for indigo, which is one of the sources from which it was originally procured. It exists amongst the products of the distillation of coal, and probably other organic compounds, but is always obtained by the manufacturing chemist either from indigo or from nitro-benzole. Dr. Hofmann, to whom we are mainly indebted for our knowledge of the chemistry of this substance, gives the following directions for obtaining it from indigo: "Powdered indigo boiled with a highly concentrated solution of hydrate of potassa, dissolves with evolution of hydrogen gas to a brownish-red liquid, containing a peculiar acid, called the *anthranilic* acid. If this matter be transferred to a retort, and still further heated, it swells up, and disengages aniline, which condenses in the form of oily drops in the neck of the retort and in the receiver. Separated from the ammoniacal water by which it is accompanied and re-distilled, it is obtained nearly colorless. The formation of aniline from indigo is represented by the following equation:

Indigo. Hydrated Potassa. Aniline. Carbonate of Potassa.

$$\overbrace{C_{16}H_{10}N_2O_2} + \overbrace{8KOH} + 2H_2O = \overbrace{2C_6H_7N} + \overbrace{4K_2CO_3} + 4H_2."$$

By this process, the indigo is made to yield about one-fifth of its weight of pure aniline. Nitro-benzole is converted into aniline by the action of various reducing agents, such as hydrosulphate of ammonia, or acetate of protoxide of iron; and the distillation of one part of nitro-benzole, one part of acetic acid, and one and a half parts of iron filings, is regarded by Hofmann as the best means of preparing aniline, which is now required in large quantities for the manufacture of artificial dyestuffs.

"When pure," says Dr. Hofmann, "aniline forms a thin, oily, colorless liquid, of faint vinous odor, and aromatic burning taste. It is very volatile, but has nevertheless a high boiling-point, 364° F. (184.5° C.). In the air it gradually becomes yellow or brown, and acquires a resinous consistency. Its density is 1.028. It is destitute of alkaline reaction to test-paper, but is remarkable for the number and beauty of the crystallizable compounds it forms with acids. Two extraordinary reactions characterize this body, and distinguish it from all others—viz., that with chromic acid, and that with solution of hypochlorite of calcium. The former gives with aniline a deep greenish or bluish black precipitate; and the latter, an extremely beautiful violet-colored compound, the fine tint of which is, however, very soon destroyed." In the manufacture of aniline on a large scale several bases having higher boiling points than aniline are formed. To one of these—a beautiful crystalline compound, represented by the formula $C_{12}H_{14}N_2$—the name of *paraniline* has been given, from its being polymeric with aniline. Aniline is a substance of the greatest importance in theoretical organic chemistry, from the large number of derivatives and substitution products which it yields, and for the knowledge of which we are almost entirely indebted to Hofmann, whose investigations originally appeared in a series of papers in the *Transactions of the Philosophical Society*. These compounds are, however, for the most part of too complicated a nature to be noticed in these pages. But, independently of its theoretical importance, this substance has recently been extensively employed in the arts, a series of coloring matters of unequaled beauty having been obtained from it by the action of various reagents. It is to Mr. W. H. Perkin that we are indebted for the idea of applying practically the property possessed by aniline of forming violet and blue solutions with chromic acid and with hypochlorite of calcium, to which we have already referred; and he succeeded in fixing these colors, and adapting them to the use of the dyer. The most important of these coloring matters are described in the article DYE-STUFFS (q.v.).

(4.) Trinitrophenol, $C_6H_2(NO_2)_3(OH)$, in which three of the atoms of hydrogen of phenol are replaced by three molecules of the group, NO_2; known as carbazotic acid (q.v.), and picric acid. In addition to the remarks contained in the article on CARBAZOTIC ACID, it may be noticed that while a solution of this acid communicates a bright yellow tint to animal textures, as the skin, wool, and silk, it has no such effect on tissues composed of vegetable fibers, such as cotton and linen, and hence it may be employed to ascertain whether the materials of any tissue belong to the animal or to the vegetable kingdom. A solution of a salt of this acid, when treated with indigo, yields a beautiful green color, which is employed in the manufacture of artificial flowers, and for various other purposes. In doses of 1 to 10 grains, it acts on rabbits as a strong poison, occasioning convulsions and speedy death. It has been prescribed in small doses, with moderate success, in cases of intermittent fever; but patients to whom

it is given should be previously informed that it possesses the property of giving to the eye a yellow, and, as it were, a jaundiced appearance. All the salts of this acid are of a beautiful red or yellow tint, and most of them form brilliant crystals. When heated, or in some cases when only struck, they explode with considerable violence.

PHE'ON, in heraldry, the barbed head of a dart. It is represented as engrailed on the inner side, and its position is with the point downward, unless otherwise blazoned.

PHE'RÆ, a powerful city of Thessaly, near mount Pelion; according to legend, the ancient royal seat of Admetus and Alcestis; and afterward of political consequence under "tyrants" of its own, who long made their influence felt in the affairs of Greece, and repeatedly attempted to make themselves masters of Thessaly. One of these tyrants named Alexander, is particularly celebrated for his cruelties. It was one of his practices to bury innocent persons alive, and another to sew them up in the skins of wild beasts and set his hounds upon them. After a bloody reign of thirteen years he was slain by his wife and her brother, 357 B.C. Five years later, Pheræ, with the rest of Thessaly, became subject to Philip of Macedon.—At Pheræ there was a mineral spring, named Hyperia, famous for its healing virtues. A few ruins at Velestinos still mark the site of the city.

PHERECY'DES, an ancient Greek writer, b. in the island of Syros, one of the Cyclades in the 6th c. B.C. He is said by Diogenes Laertius to have been a rival of Thales, and to have learned his wisdom from the Egyptians and Chaldeans. He wrote a cosmogony in a kind of prose much resembling poetry, under the title *Heptamychos,* the meaning of which is doubtful. In a manner rather poetic than philosophic, he endeavored in this work to show the origin of all things from three eternal principles, *Time* or *Kronos; Earth,* as the formless and passive mass; and *Æther* or *Zeus,* as the formative principle. He taught the doctrine of the existence of the human soul after death; but it is uncertain if he held the doctrine of the transmigration of souls, afterward promulgated by his disciple, Pythagoras. Of his work, only fragments are extant, which have been collected and elucidated by Sturtz (Gera, 1798; 2d ed., Leip. 1824).—Another Pherecydes who lived in the 5th c. B.C., compiled the mythical histories of Athens and other states, but, except a few fragments, the work is lost. See Sturtz, *Pherecydis Fragmenta* (Leip. 1824).

PHID'IAS, or **PHEI'DIAS** (Lat. *Phidias*), son of Charmides, the greatest sculptor of ancient Greece, b. at Athens probably between 500–490 B.C. His first instructor in art was Hegias of Athens; he afterward studied under a more famous master, Ageladas of Argos. He appears to have first acquired distinction in his profession soon after the battle of Salamis, and indeed his great works were all executed during a period most favorable for the development and encouragement of genius, when Greece was triumphant over external enemies, and her people enjoyed a more perfect liberty than almost at any other period of their history. With the character of the age correspond the works of its poets, particularly of the tragedians Æschylus, Sophocles, and Euripides, and of its sculptors, particularly of Phidias. Under Cimon's administration the Athenians began the work of restoring their city, which the Persians had destroyed, in more than its former magnificence, and to fill it with noble works of art. Phidias was accordingly employed in making the colossal brazen statue of Minerva, *Athena Promachos,* which was placed upon the citadel, and was executed probably about 460 B.C. To the government of Cimon succeeded that of Pericles, still more brilliant, and signalized by an extraordinary development of art. Pericles not only gave to Phidias a commission to execute all the more splendid statues that were to be erected, but made him general superintendent of all works of art going on in the city. Plutarch tells us that Phidias had under him architects, statuaries, workers in copper and bronze, stone-cutters, gold and ivory beaters, etc. To Phidias, as director-general of all the skilled artists and artificers of Athens, we owe, among other glorious edifices, the Propylæa and the Parthenon, the sculptured ornaments of which were executed under his direct superintendence, while the statue of the goddess Athene, the materials for which were ivory and gold, was the work of Phidias himself (*circa* 438 B.C.). This statue was clothed with a golden robe, which alone was worth 44 talents of gold. The statue is gone for ever, and the Parthenon is now only a magnificent wreck, but we still possess some splendid evidence of the genius of Phidias, in the sculptures of the metopes, and friezes of the temple of Athene. See ELGIN MARBLES. Next year Phidias went to Elis, where he executed a colossal statue of Zeus for the Olympeium at Olympia (q.v.), also of ivory and gold (about 433 B.C.). This was reckoned his masterpiece. On his return to Athens, political passions were running high. There was a strong—at least a violent—party inimical to Pericles, but as they did not dare to attack the great statesman, they assailed him through his friends Phidias, Anaxagoras, Aspasia, etc. Phidias was accused of having appropriated to himself some portion of the gold destined for the robe of Athene. This accusation he repelled by taking off the robe and weighing it. He was then accused of impiety, for having introduced his own likeness and that of Pericles on the shield of the goddess. On this most frivolous and contemptible pretext he was thrown into prison, and died there, but whether of sickness or poison is uncertain. His death took place about 432 B.C. The works executed by or ascribed to Phidias were numerous, but we have mentioned the most celebrated. Their prevailing characteristic appears to have been an

ideal sublimity, and even the imperfect relics that we possess are the most noble specimens of sculpture in the world. See illus., GRECIAN SCULPTURE, vol. VII.; SCULPTURE, vol. XIII.

PHIGALIAN MARBLES, the name now given to the sculptured frieze taken from the cella or the temple of Apollo at Phigalia in Arcadia in 1814, and transferred to the British Museum. It represents the contests between the Centaurs and Lapithæ. The Phigalian temple of Apollo is, next to the Theseium at Athens, the most perfect architectural ruin in all Greece; but owing to its sequestered position at the head of a lonely and rocky glen among the Arcadian hills, it long remained unknown in modern times, except to the shepherds of the district; and to the same circumstance it probably owes, in part, its preservation. Chandler first visited and described it in 1765; he was followed by Gell, Dodwell, and others; and in 1812 it was very carefully examined by a body of artists and scholars, the results of whose investigations are given in Stackelberg's *Der Apollo-tempel zu Bassä in Arkadien* (Rome, 1826). The temple is built of a hard yellowish-brown limestone, stands n. and s., was originally about 125 ft. long and 48 broad, and had 15 columns on either side, and 6 on either front, of which 36 still remain.

PHILADELPHIA, in Lydia. See ALA-SHEHR.

PHILADELPHIA, the principal city of Pennsylvania, and the third city in population in the United States, is situated on two large rivers: the Delaware, which separates it from New Jersey, and the Schuylkill, which flows through it, joining the Delaware at League Island; lat. 39° 57′ north; long. 75° 9′ west; 96 miles from the Atlantic ocean, 85 miles southwest of New York, and 125 miles in a direct line from Washington.

HISTORY.—Philadelphia, meaning "the city of brotherly love," was founded and named by William Penn. A small party of colonists sent out by him arrived in September, 1681. Penn himself came in October, 1682, but the settlement was laid out by his commissioners several months earlier. A few weeks after Penn's arrival the first treaty with the Indians was made at Shackamaxon. A few Swedes occupied part of the present city, but they received the new settlers with friendliness, as did the Indians. The limits of the town were Vine and Cedar Streets and the two rivers; and by 1684 it contained over 300 houses and 2500 people. The immigration from England, Wales, Germany and Holland in 1683–84, and for some years later, was large; the majority of the settlers being Quakers, whose influence predominated for many years. The first colonial assembly was held at Chester in 1682, the second was held in Philadelphia, January, 1683. Penn returned to England in 1684, and did not revisit the city till 1699, when he found a population of 4500 and 700 houses. Penn presented the city charter in 1701, though its incorporation dates from 1691. The first English school was opened in 1683; the *American Weekly Mercury* was started in 1719; Franklin's *Pennsylvania Gazette* in 1729, merged in the *North American* in 1840; and the *Pennsylvania Journal* and *Weekly Advertiser* was started in 1742. In 1741 the city was divided into 10 wards, and there were then 1621 taxable citizens; and from the early part of the century rivalled Boston as the leading city of the colonies. In 1742 the exports to Great Britain amounted to £8527 12s. 8d., the imports, to £75,295 3s. 4d. In 1723 Benjamin Franklin, the man who, next to Penn, exerted the greatest influence on affairs, came to the city. In 1747, by the publication of his *Plain Truth*, Franklin roused a spirit of military enthusiasm, a force of 10,000 was raised, and a battery was erected below the city, on the site of the present United States Navy Yard. In 1751 the first line of packet boats to New York was established, followed, in 1756, by a stage line. Under Franklin's influence, in 1747 the merchants of Philadelphia sent a ship to discover the northwest passage. The first theatre was opened in 1754 by a company of comedians from London. In 1755 a militia bill was passed, and Franklin became colonel of the city regiment. From 1763–64 Philadelphia was prominent in resisting British aggression, though the loyalist party was strong, and most of the Friends opposed warfare; and in it most of the important official events of the Revolution took place. The first Continental Congress met in Carpenter's Hall, September 5th, 1774; the second met May 10th, 1775, in the State House; and there, on June 15th, Colonel George Washington was appointed general and commander-in-chief of the Continental army. In 1776 Congress met for the third time in the State House, where the Declaration of Independence was adopted, July 4th, and proclaimed July 8th. Philadelphia was held by the British from September, 1777 to June 18th, 1778. The battle of Germantown was fought October 4th, 1777. Delegates from the different states met at the State House in May, 1787, to draw a new constitution, the session lasting till September 17th. A new city charter was granted by the legislature March 11th, 1789. Two visitations of yellow fever, in 1793 and 1798, caused great loss of life; in the first 4000 deaths resulted. The city was the capital of Pennsylvania until 1799; the seat of the Federal Government from 1790 to 1800, and the monetary centre till 1836. In 1812 the steam water-works at Fairmount were begun and started in 1815. The Philadelphia, Germantown and Morristown Railroad was completed in 1832; and the same year nearly 1000 deaths resulted from Asiatic cholera. Anti-slavery and religious riots disturbed the city from 1834 to 1844; and the suppression of the Bank of the United States in 1836 for a time prostrated commerce. Gas was introduced in 1836, and the first telegraph line was established in April, 1846. February 2d, 1854,

a consolidation act was passed by the legislature, extending the city limits to the county boundaries, and uniting under one municipal government all the outlying districts, known as Southwark, Northern Liberties, Kensington, Spring Garden, Moyamensing, Penn, Richmond, West Philadelphia and Belmont; also the boroughs of Germantown, Manayunk, and other townships. Philadelphia took an active part in the Civil War, and raised more than $1,000,000 by a sanitary fair in 1864. The centenary of American Independence was celebrated in 1876 (see CENTENNIAL); the bi-centennial of the landing of William Penn in 1882; and the centennial of the signing of the Constitution in 1887.

TOPOGRAPHY.—The city lies principally on a low peninsula between the two rivers. In the closely built portion the greatest elevation is only forty-six feet, while in the suburbs the ground rises to a height of 440 feet. The length from north to south is 22 miles, and the width is from five to ten miles, covering an area of about 129 square miles, or 82,603 acres, making Philadelphia the second city in extent in the United States. It is bounded on the northeast by Poquessink creek, and on the southwest by Cobb's and Darby creeks. On the Delaware river the city has a water front of more than twenty miles, over five miles being occupied by wharves. The river is navigable for large vessels, having at the wharves an average depth of 50 feet; and the harbor has been improved by the removal of the islands in the center of the river. The Schuylkill is navigable for small vessels only, and is crossed by numerous bridges within the city limits, the finest of which are the Girard avenue and the Spring Garden street bridges. That part of the city lying west of the Schuylkill, and known as West Philadelphia, includes several former townships and villages, some of which retain their old names. The largest of these old towns is Germantown, which was settled in 1683, was the scene of the battle of October 4th, 1777 (see GERMANTOWN), and contains several old houses, the Chew house, with marks of cannon-balls, the Johnson house, the Mermaid inn, and the Wakefield mills. It is one of the finest suburbs, and has many beautiful residences. Chestnut Hill, another beautiful suburb, lies on the highest ground in the city. On the southern side of the mouth of the Schuylkill is Fort Mifflin and the site of Mud Fort, built in 1777; new fortifications are to be constructed opposite on the site of the Revolutionary Fort Mercer. Just above the mouth of the Schuylkill is the League Island navy yard, one of the largest in the United States, with an area of 923 acres.

The city is laid out with extreme regularity, and contains over 1,300 miles of streets, a large part of which is improved. In the original plan Penn laid out two wide streets, Market and Broad, crossing at right angles, with an open space at their intersection, and four other squares in the sections thus formed. Nearly all the other streets are parallel to these two. Those running north and south are numbered from the Delaware to the Schuylkill, while those running east and west are named. The numbering of houses is very exact; with the streets running east and west, beginning at the Delaware; and with those running north and south beginning at Market street; and with each block a new hundred of numbers commences. Philadelphia contains more small houses than any other large city in the world; tenement-houses are almost unknown, and the average number of inhabitants to a dwelling is 5.6 persons, while that of New York is 16.37. Many houses in the older portions are of the characteristic red brick, with white marble trimmings; but in the newer sections the architecture is as varied as that of any modern city.

BUILDINGS.—In the center of the city, at the intersection of Broad and Market streets, is the City hall, generally known as the Public buildings, on a plot of ground once known as Penn square. This enormous structure, probably the largest building in the United States, is 486 feet long from north to south, and 470 feet wide, and covers an area of four and a half acres. The building, in modified French Renaissance architecture, is of granite and white marble, with a central tower 547 feet high, surmounted by a statue of William Penn, 37 feet in height. It contains 520 rooms, and is adorned with statuary in the interior and with huge statues on the numerous pediments. On the west side of the square, opposite the City Hall, is the Broad street station of the Pennsylvania railroad, ten stories in height, with a frontage of 307 feet. Above the main entrance rises a fine tower, 240 feet in height. The train-shed is 700 feet long by 307 feet wide, and contains sixteen tracks. An elevated road-bed leads to the Schuylkill river. On the north side of the square is the stately Masonic temple, built of granite in Norman style at a cost of $1,500,000. Two of its greatest beauties are the tower, 230 feet high, and the carved Norman porch. The lodge rooms are elaborately decorated in Egyptian, Norman, Ionic, Corinthian, Renaissance, Gothic and Oriental styles. On the east side of the square is John Wanamaker's retail store, occupying an entire block. East of Broad street, on Chestnut, is the United States mint, a white marble building with an Ionic portico. The original building, erected in 1792, was the first structure in the United States built under the Federal Government. The present building dates from 1829–33. For many years all coinage was carried on here, and now all the smaller coins and all devices and dies are made here. The value of the coinage since the establishment of the mint to 1891 was $1,056,337,771. A larger building has become necessary, and a new one is under construction at Sixteenth and Spring Garden streets. West of the old mint, on Broad street, is the Romanesque building of the Girard life insurance company. Adjoining it is the handsome Betz building, thirteen stories high, and containing

REFERENCES.

DEPOTS.

A. Baltimore & Ohio R. R., G. 18.
B. Camden & Atlantic, Vine St. Ferry, K. 17.
C. Cam. & Atl'c, Cooper's Pt. (Camden), L. 17.
D. Camden & Atlantic, Market St., K. 18.
E. Cam. & Atl'c, Federal St. (Camden), L. 18.
F. Pennsylvania R. R., Broad St. Sta., H. 18.
G. Penna. R. R., Kensington Depot, K. 14.
D. Pennsylvania R. R., Amboy Div., K. 18.
H. Philadelphia & Reading R. R., 9th and Green streets, J. 16.
N. Philadelphia & Reading R. R., 12th and Market streets, I. 18.
J. Philadelphia & Reading R. R., Broad and Callowhill, I. 17.
K. Phila. & Read. R. R., Atl. City Div., K. 18.
L. Atlant'c City R.R., L. 20.
M. Phila., Newtown & New York, K. 13.
F. West Jersey R. R. Station, L. 18.
F. Phila., Wil. & Balt. R. R., H. 18.

HOTELS.

1. Aldine, H. 18.
2. Bellevue, I. 18.
3. Bingham House, I. 18.
5. Colonnade, H. 18.
6. Continental, J. 18.
8. Girard House, J. 18.
7. Hotel Stenton, I. 18.
9. Lafayette Hotel, H. 18.
10. Stratford, I. 18.
11. Windsor, L. 17.

PROMINENT INSTITUTIONS AND BUILDINGS.

13. Academy of Fine Arts, I. 17.
14. Academy of Natural Sciences, H. 17.
15. American Sunday School Union, I. 17.
17. Baldwin Locomotive Works, I. 16.
20. Blockley Almshouse, E. 19.
21. Carpenter's Hall, K. 18.
24. City Hall, I. 18.
25. Custom House, J. 18.
26. Winter Circus, I. 17.
27. Drexel Building, J. 18.
28. Drexel Institute, F. 18.
29. Eastern Penitentiary, G. 16.
30. Fairmount Water Works, F. 16.
32. Franklin's Grave, J. 17.
33. Girard College, G. 15.
35. Hahnemann Medical College, I. 17.
36. Independence Hall J. 18.
37. Jefferson Medical College, I. 18.
39. League Island Navy Yard, H. 27.
40. Manufacturers' Club, I. 18.
41. Masonic Temple, I. 18.
43. Mercantile Library, I. 18.
44. Merchants' Exchange, K. 18.
45. Moyamensing Prison, I. 20.
47. Naval Asylum, G 19.
48. Pennsylvania Hospital, J. 19.
50. Penna. Hospital for the Insane, C. 17.
51. Pennsylvania Institution for the Deaf and Dumb, I. 19.
52. Penn Treaty Monument, L. 15.
54. Philadelphia Art Club, I. 18.
55. Philadelphia Library, I. 18.
56. Philosophical Society, J. 18.
58. Post-office, J. 18.
59. Ridgway Library, I. 19.
60. St. Agnes Hospital, I. 21.
61. Spreckles Sugar Refinery, K. 20.
62. Spring Garden Water Works, E. 15.
63. Union League Club House, I. 18.
65. United States Mint, I. 18.
66. University of Pennsylvania, F. 18.
67. Wanamaker's Merc. Establishment, I. 18.
69. Young Men's Christian Ass'n, I. 18.
70. Zoölogical Garden, E. 15.

CHURCHES.

71. Arch Street M. E., I. 17.
73. Bethany Presbyterian, G. 19.
74. Cathedral of St. Peter and St. Paul (R. C.), H. 17.
75. Christ Memorial, D. 18.
77. Christ Protestant Episcopal, K. 18.
78. Ch. of St. James the Greater (R. C.), E. 18.
80. Ch. of St. James the Less (Epis.), E. 11.
82. Church of the Gesu (R. C.), H. 15.
85. Ch. of the Messiah (Universal.), I. 14.
86. First Baptist, I. 17.
88. First Presbyterian, J. 18.
89. Grace Baptist, I. 19.
90. Holy Trinity (Prot. Epis.), H. 18.
91. Luth. Ch. of the Holy Communion, I. 17.
92. Old Swedes', K. 20.
93. Rodef Shalom, Synag. (Hebrew), I. 16.
95. St. Ann's (R. C.), M. 13.
97. St. James' Epis. (Kingsessing), B. 23.
99. St. James (Prot. Epis.), G. 18.
100. St. John's (R. C.), L. 18.
101. St. Mark's (Prot. Epis.), H. 18.
103. St. Peter's (Prot. Epis.). K. 19.
104. St. Stephen's (Prot. Epis.), J. 18.
105. Second Presbyterian, G. 18.
107. Second Reformed Episcopal, G. 18.
108. Swedenborgian, G. 18.
109. Tabernacle Presbyterian, E. 18.

PLACES OF AMUSEMENT.

113. Academy of Music, I. 18.
114. Arch Street Theatre, J. 17.
115. Baseball Park, H. 12.
116. Athletic Ball Ground, I. 12.
117. Chestnut Street Theatre, I. 18.
118. Grand Opera House, I. 14.
120. National Theatre, L. 17.
121. Park Theatre, I. 16.
122. Point Breeze Park, G. 25.
124. South Broad Street Theatre, I. 18.

over 300 offices. On Chestnut street, the chief street of Philadelphia, are many of the finest buildings. On 12th street is the William Penn charter school, founded in 1689, and the handsome house of the New Century club. On 10th street is the Mercantile library, founded in 1821, containing 177,000 volumes. At the corner of 9th street is the post-office, a large Renaissance granite building, costing nearly $8,000,000, and containing the United States court rooms and offices of the Federal officials. Next it, on Chestnut street is the fine granite office of the *Record*, and adjoining that is the attractive Saracenic building of the Penn Mutual Life, and next stands the Singerly building, also with an elaborate façade. In this district are many of the leading stores, theaters, hotels, and newspaper offices. At the corner of 6th street is the Public Ledger building, at the angle of which is a statue of Benjamin Franklin. On 7th street is the Franklin institute, founded in 1824 for the promotion of mechanic arts, with a valuable scientific library, courses of lectures and drawing-schools; opposite, the Builders' Exchange, with a permanent exhibition and successful trades-schools. On Chestnut street, between 5th and 6th, stands Independence Hall, the State House of Colonial times, and the most famous historic building in Philadelphia. It is a plain brick building, erected in 1729–34; in the East Room the second continental congress met in 1776, and there, July 4th, 1776, congress in secret session adopted the Declaration of Independence, which was read publicly on the 8th in the square behind the State House. In 1787 the constitutional convention met in the hall and drew up and adopted the constitution of the United States. The hall is almost as when Congress met there, and contains the old furniture—the table on which the Declaration was signed, Hancock's chair, with the emblem which caused Franklin to wonder whether it meant the rising or the setting sun. On the walls are portraits of most of the signers, and the original "Rattlesnake" flags, with the motto, "Don't tread on me." In the museum, on the same floor, is West's painting of Penn's Treaty with the Indians, Ramsay's portrait of George III., the original charter of the city, the silver inkstand used in signing the Declaration of Independence, and the famous Liberty Bell, with its prophetic inscription. West of the State House is Congress Hall, occupied in early days by the Federal Government, and where Washington was inaugurated in 1793 and John Adams in 1797. Fronting Independence Hall is the Romanesque building of the Pennsylvania company for life insurance and annuities, organized in 1809. Near Chestnut, on 5th street, is the American philosophical society, an outgrowth of the "Junto" club, founded by Franklin in 1743, and the oldest institution of its kind in America. At the corner is the magnificent Drexel building, of white marble, ten stories high, and containing the rooms of the Stock Exchange and the Board of Trade. The new Bourse extends from 4th to 5th streets, with arcades leading to Chestnut and Market streets, and is 362 feet long and 130 feet wide, and ten stories in height. The building is of stone, light brick and terra-cotta, and cost with the land $2,000,000. On the first floor is the great hall, divided by rows of columns, and the tenth floor is devoted to a museum of trade. On the next block is the Custom-House, modeled after the Parthenon, and considered one of the best specimens of Doric architecture in the world. It was originally erected in 1819–24 for the Second United States Bank. From Chestnut street between 3d and 4th streets, a court leads to Carpenters' hall, a small, plain brick building, where the first continental congress met, September 5th, 1774. It was built in 1770 by the Society of Carpenters, and was used for public meetings, and finally became an auction-room, but was restored by the Company of Carpenters to its original appearance, and now contains many interesting relics of Revolutionary days. The Commercial Exchange, on 2d street, is on the site of the house of William Penn. On Walnut street, which runs parallel with Chestnut, is the Merchants' Exchange, at the intersection of 3d and Dock streets, a handsome building with a semi-circular Corinthian portico. Near it is the Gerard Bank, also a Greek structure, built for the first United States Bank, and afterwards owned by Stephen Girard. In this vicinity are the handsome buildings of numerous insurance companies, and at the corner of 4th street is the imposing Bullitt building. Between 6th and 7th streets Walnut passes Washington square, one of the five parks of the original plan, a prettily laid out square of six acres, containing a great variety of trees. On the east side is the Athenæum Library, organized in 1814; and at the southwest corner is the granite building of the Saving-Fund Society, founded in 1816. Two blocks south of Walnut street is the Pennsylvania Hospital, occupying an entire square, bounded by Spruce, Pine, 8th and 9th streets. It was chartered in 1751, and the corner-stone was laid in 1755. At the corner of Locust and 13th streets is the building of the Historical Society of Pennsylvania, which was founded in 1824. It contains the Tower collection of colonial laws, books printed in Philadelphia from 1685 to 1785, a collection of colonial newspapers, manuscripts relating to the Penn family, and the Maclure collection of books on the French Revolution. Among the many interesting relics are Penn's original Instructions, his Wampum Treaty Belt and Bible, the *Bradford Almanack* of 1686 (the first book printed in the United States), the first copy of *Poor Richard's Almanack*, the first Bible printed in America, one of the Stamp Act stamps, part of Franklin's printing-press, the old charter of Philadelphia, and portraits of Penn, Franklin, Washington, Morris and others. Diagonally opposite is the College of Physicians, incorporated in 1680, containing a valuable medical library, ranking next to that of the Royal College of

Physicians in London. In this neighborhood are many of the leading clubs; the finest building is that of the University club, in Spanish-Moorish style. On Locust street, corner of Juniper, is the main building of the Philadelphia Library, founded in 1731 by Benjamin Franklin and other members of the "Junto" club, and the first subscription library established in the United States. In addition to the library of 188,600 volumes, it contains a clock said to have belonged to Cromwell, part of Franklin's electrical machine and other relics. West of Broad street, Walnut street contains mostly private residences. Between 18th and 19th streets it passes Rittenhouse square, the "South-West square" of Penn's time, and now the most fashionable section of the city, with fine houses and many beautiful churches; prominent among the latter are the handsome Gothic Church of the Holy Trinity, the First Unitarian, and the beautiful Gothic New Jerusalem Church. On South Broad street, above Walnut, is the club-house of the Union League, the leading republican club, with 1400 members; below it is the beautiful Renaissance building of the Art club, containing two galleries, in which excellent exhibitions of pictures are given. A few doors below is the Academy of Music, a fine music-hall, capable of seating 2900 persons. Near it is Horticultural hall, founded in 1827; and at the corner of Pine street is the building formerly occupied by the Deaf and Dumb Asylum, removed in 1892 to Mount Airy. Between Christian and Carpenter streets is the handsome granite building of the Ridgway Branch of the Philadelphia Library, a bequest by Dr. James Rush, amounting to $1,500,000. It contains the most valuable books of the library and some interesting relics. A few blocks farther south is the massive Tudor building of Moyamensing prison. North Broad street contains some of the finest residences of Philadelphia in its upper part, and is one of the finest streets in the city. A short distance north of the City hall is the Academy of Fine Arts, a Venetian building with an elaborate façade, consisting of a central tower and slightly recessed wings. The principal features of the interior are the entrance hall and staircase, which are decorated with handsome marbles. The building and land cost nearly $500,000, and the collection is one of the most extensive in the country, and includes 300 paintings, bronzes, sculptures, several hundred casts, and 60,000 engravings. Some of the important paintings are West's "Rejection of Christ;" Bouguereau's "Orestes;" Vanderlyn's "Ariadne;" Wittkamp's "Deliverance of Leyden;" Carolus Duran's "Mme. Modjeska." Among the sculptures are Story's "Jerusalem;" Power's "Proserpine," Palmer's "Spring," and Lough's "Battle of the Centaurs and Lapithæ."

Opposite the Academy is the new Odd-Fellows' hall, a beautiful Italian Renaissance building of buff brick and terra-cotta; the Cyclorama; and further up is the armory of the State Fencibles. Race street leads to Logan square, facing which, on the east, is the Roman Catholic cathedral of SS. Peter and Paul, a fine stone edifice with a Corinthian portico and a dome 210 feet high. The interior is richly decorated with paintings, and over the high altar is a Crucifixion by Brumidi. On the south side of the square is the Academy of Natural Sciences, a large Gothic building of green serpentine, erected in 1875. The society, which is the oldest of the kind in the country, was founded in 1812. The museum contains many valuable collections: among them are an unrivaled collection of shells, the Morton collection of crania, and the collection of birds. On Broad street, at the corner of Spring Garden street, is the Spring Garden institute, giving instruction in drawing, painting, and mechanic arts to young men and boys. Opposite are the Baldwin locomotive works, one of the largest plants of its kind in the world, covering an area of fourteen acres. About one thousand locomotives are produced yearly. East of Broad, on Spring Garden street, is the Pennsylvania School of Industrial Art, incorporated in 1876, to develop the art industries of the state. Instruction is given in weaving and textile design, drawing, carving, modeling, and decorative painting. With it is connected the Museum at Memorial hall. A short distance above are the Boys' Central high school and Synagogue Rodef Shalom, a fine example of Saracenic architecture. On Fairmount avenue, some distance west, is the Eastern penitentiary, a celebrated prison, conducted on the individual system, At the corner of Broad and Oxford streets is the new Columbia club, one of the finest club-houses in the city. Near it is Grace Baptist temple, a handsome Romanesque building, with seats for more than 3000 persons. Opposite Grace church is the main entrance to Monument cemetery, containing a fine monument to the memory of Washington and Lafayette. At some distance is the baseball park, belonging to the Philadelphia club. On Montgomery avenue and 17th street is the Wagner Institute of Science, containing a valuable library, a museum, and laboratories. Half a mile west of Broad street, on Girard avenue, stands Girard college, one of the richest benevolent institutions in the United States, founded in 1831 by Stephen Girard for the education of poor white orphan boys. Two million dollars was given to build the college, and the greater part of Girard's estate to endow it, and the value of the bequest has increased to about $15,000,000. The main building, in Corinthian style, was designed by T. U. Walter, and is one of the finest examples of Greek architecture in the country. In the vestibule is a statue of Girard by Gevelot, and his sarcophagus. The other buildings number about twelve, the principal being of white marble, and accommodate about 1550 boys. The grounds cover forty-one acres, are lighted by seven electric masts, 125 feet high, and contain a monument to pupils who were killed in the civil war.

According to a provision of Mr. Girard's will, no clergyman is allowed to enter the enclosure. Opposite the college is the German hospital, and in the same enclosure stands the Mary J. Drexel home, founded in 1888 by Mr. Lankenan in memory of his wife. It is a beautiful Gothic building, containing a hospital and home for children and for the aged. Northeast of the college is the great Church of the Gesù, with a beautifully decorated interior, and several Roman Catholic schools and hospitals. To the north are the handsome buildings of the Woman's medical college and Women's hospital. The principal entrances to Fairmount park are at the end of Girard avenue and Green street. The park is the largest city park in the world, having an area of over 3000 acres, and extends along both banks of the Schuylkill for over 7 miles, and for over 6 miles along the picturesque valley of Wissahickon creek. Near the Green street entrance is the hill from which the park takes its name, and from which a fine view is obtained. Beyond an open space, with a fine bronze statue of Lincoln, is Lemon hill, on top of which is Robert Morris's mansion. Crossing the river by the handsome Girard Avenue bridge, 120 feet wide, the larger part of the park is reached. On the south is the Zoological garden, containing the finest collection in the country. It occupies the tract formerly the country-seat of John Penn, whose house, the "Solitude," is still standing. A short distance beyond is the Penn or Letitia house, built in 1682, the first brick house in the city, removed to this point from its old location. The park contains two of the Centennial exhibition buildings—Memorial hall, now containing a valuable art collection, and Horticultural hall, now used as a winter-garden.

West Philadelphia contains many beautiful residences and numerous public institutions. On Woodland avenue are the handsome Gothic buildings of the University of Pennsylvania, first chartered in 1753, Dr. Franklin being one of the originators. The principal buildings are College hall, built of serpentine, with gray stone trimmings: the beautiful library of redstone and brick, designed by Mr. Frank Furness, and one of the finest and most convenient library buildings in the world. It contains about 140,000 volumes and valuable collections. Near by, on Spruce street, is the University hospital, which is connected with the medical department of the university; and south lies the large Blockley almshouse, and near it the Philadelphia hospital, the oldest in the United States. At the corner of Chestnut and 32d streets is the Drexel institute, opened in December, 1891, founded by Mr. A. J. Drexel at a cost of $1,500,000. The building is large and very ornate, of brick and terra-cotta, and is a fine example of classic Renaissance architecture. The noble entrance leads to a large central court, 65 feet square, open to the roof. On the main floor are a museum, a lecture-hall, an auditorium seating 1500 persons, and a library with a collection of rare manuscripts and autographs, presented by Mr. G. W. Childs. There are departments of science, art, and general industrial training, and there is an attendance of 1500 students. North of Market street, between 42d and 50th streets, is the Pennsylvania hospital for the insane, usually known as Kirkbride's hospital, a branch of the Pennsylvania hospital, from which it was set off in 1841. The extensive and handsome buildings are situated in grounds covering one hundred and eleven acres, and contain West's painting of "Christ Healing the Sick."

In the old part of the city, the Penn national bank, at the corner of Market and 7th streets, is on the site of the house in which Jefferson wrote the Declaration of Independence, and on Arch street, near 2d, is the house in which the first American flag was made by Mrs. John Ross in 1777. On 2d street, below Arch, is Christ church, a colonial brick edifice built in 1727–37 on the site of a church erected in 1695. In the churchyard on 5th street are the graves of Benjamin Franklin and his wife, and of other prominent citizens. Near the Delaware, below Christian street, is the interesting old Swedes' church (Gloria Dei), built in 1700, on the site of an old wooden church of 1646. Near by is the enormous sugar refinery of Claus Spreckels. On Beach street, near the river, the Penn treaty monument marks the probable site of Penn's treaty with the Indians in 1682. Farther north is Cramp's shipyard, one of the most important in the country, employing about 4000 men. Many of the new vessels for the navy and large ocean steamers have been built here. On the Schuylkill river are the United States naval asylum and the arsenal.

Education. — In 1896 the city had public school property valued at over $11,000,000. The number of pupils was 163,000, and of teachers was 3100 with an expenditure of over $3,500,000. The nautical school-ship Saratoga is stationed here. The higher institutions are the University of Pennsylvania (q. v.), La Salle college (Roman Catholic), and Girard college. In addition to the University medical school there are the Jefferson, Hahnemann, Homeopathic, Woman's, and two eclectic medical colleges; a training-school for nurses, two schools of pharmacy, and two of dentistry. Industrial education is provided by the Franklin, Wagner, Spring Garden and Drexel institutes, and the Polytechnic college. The principal art schools are those of the Academy of Fine Arts, the Pennsylvania School of Industrial Art, the Normal Art School and the School of Design. There are Roman Catholic, Episcopal and Lutheran divinity schools, a school of oratory, and a conservatory and school of music. In the vicinity of Philadelphia are Haverford, Swarthmore, and Bryn Mawr colleges, and the Williamson School of Mechanical Trades, costing $2,125,000.

LIBRARIES.—The chief libraries are the Philadelphia, 188,600 volumes; the Mercantile, 177,000 volumes; the Historical Society, 40,000; the Athenæum, 30,000; Apprentices', 17,300; Public, 105,000; Franklin Institute, 42,000; American Philosophical Society, 50,000, and the Academy of Natural Science, 40,000 volumes. There are over 300 daily and weekly newspapers, monthly periodicals, and other publications. The leading dailies are the *Public Ledger*, the *Record*, *Press*, *North American*, *Times* and *Evening Star*.

CHURCHES AND INSTITUTIONS.—There are over 600 churches in Philadelphia and hundreds of charitable associations. The leading hospitals are the Pennsylvania, and the Insane, State, Municipal, Orthopædic, Children's, Women's, Wills', German, Jewish Episcopal, Presbyterian, St. Joseph's and St. Mary's and the Homeopathic. There are numerous homes for the aged, orphanages, and other homes. The most noted cemetery is Laurel Hill.

HOTELS, CLUBS, THEATERS.—The leading hotels are the Stratford, Bellevue, Lafayette, Colonnade, Continental, Aldine and Bingham. The most prominent clubs are the Philadelphia, Union League, University, Columbia, Art Club, New Century, Catholic, and Schuylkill Navy Athletic Club. The principal theaters are the Academy of Music, Arch Street theater, Chestnut Street opera house, Chestnut Street theater, Broad Street theater, Park, Walnut Street theater, Lyceum, Germania, and National theaters.

COMMERCE.—The value of the imports of foreign merchandise in 1896 was $39,807,278; of exports of domestic merchandise, $42,776,884. The city has several lines of European and coastwise steamships. The principal railroads are the Pennsylvania, the Philadelphia and Reading, both with several divisions, the Philadelphia, Wilmington, and Baltimore, the Philadelphia, Reading, and New England, the Philadelphia, Newton, and New York, the Baltimore and Ohio, the Atlantic City, and the West Jersey and Seashore.

MANUFACTURES.—The city ranks next to New York in the value of its manufactures. In 1890 the U. S. census reported for Philadelphia 18,166 manufacturing establishments, employing $375,249,715 capital and 260,264 persons, paying $135,917,021 for wages and $311,645,804 for materials, and having a combined output valued at $577,234,446. The principal industries in the order of value of output were the refining of sugar and molasses, $46,598,524; foundry and machine shop products, $29,554,444; men's clothing, $23,264,135; carpets and rugs, $22,000,000; woolen goods, $21,919,781; hosiery and knit goods, $14,932,981; printing and publishing, $13,397,217; cotton goods, $11,514,601; morocco, $10,840,198; malt liquors, $10,506,692; chemicals, $9,674,910; slaughtering and meat-packing, $9,146,513; petroleum refining, $8,646,952; and silk and silk goods, $8,059,604.

BANKING AND INSURANCE.—Philadelphia does not make as large a showing in the number of national, state and savings banks as would be expected in a city of its size, because it contains more building and loan associations than any other city in the country and has a large number of trust companies, both of which classes of institutions practically do a discount and savings business. There are 41 national banks, with a combined capital of $21,965,000, deposits $92,469,874, and reserve $27,960,638; about the same number of trust companies, with a larger aggregate capital; 20 life, fire, and marine insurance companies, and over 400 building and loan associations of purely local organization.

GOVERNMENT.—The municipal government consists of a mayor, elected for four years, the select council of 37 members (1895), representing the 37 wards of the city, chosen for 3 years, and the common council of 120 members, elected for 2 years. The new charter of 1887 greatly increased the power of the mayor and consolidated the municipal departments under the heads of public works, public safety, charities, and correction, finance, law and education. The directors of the first three departments are appointed by the mayor; the heads of the finance and law departments are elected. Each ward has a local board of education and there is a central board for the whole city. The United States District Court for the Eastern District of Pennsylvania, the United States Circuit Court for the Third Circuit and the Supreme Court are held in Philadelphia. There are also courts of common pleas with 12 judges, orphans' court with 4 judges, and over 25 magistrates. The net debt in 1896 was $35,625,071; assets above sinking funds, $8,145,859; assessed valuation of real and personal property, $818,827,549.

WATER.—Water is supplied mainly from the Schuylkill river, and the total capacity of all the reservoirs is one billion gallons, to be increased by a new reservoir with a capacity of 400,000,000 gallons. The present pumping capacity of the various stations is over 200,000,000 gallons daily, and the daily consumption is over 150,000,000 gallons. The principal water-works are picturesquely situated in Fairmount park. The gas-works are controlled by the city, and have a daily manufacturing capacity of twenty million cubic feet. The city is well equipped with electric lights and with electric and cable street railroads.

MILITIA.—The militia includes the 1st, 2d and 3d regiments of the Pennsylvania National Guard, Battery A, the First Troop of City Cavalry, the State Fencibles, the Gray Invincibles, and the Hartranft Light Battery.

MARKETS.—Philadelphia is famed for the excellence of its markets, the finest of which is the Farmers' market, located beneath the Reading terminal station.

POPULATION.—In 1683 the population was 500; 1700, 4500; 1778, 21,767; 1860, city and co., 565,529; 1870, 674,022; 1880, 847,170; 1890, 1,046,964.

See Proud's *History of Pennsylvania* (Phil., 1797); Watson's *Annals* (Phil., numerous editions); Scharf and Westcott's *History of Philadelphia* (Phil., 1887); Allinson and Penrose's *Philadelphia* (1681–1887); *A History of Municipal Development* (Phil., 1887); Day's *Historical Collections of Pennsylvania* (Phil., 1843).

PHILADELPHUS, a genus of shrubs, containing the mock orange or syringa, belonging to the order *saxifragaceæ* or saxifrage family, and tribe hydrangieæ, which also includes the genus hydrangea. In philadelphus the calyx tube is top-shaped and coherent with the ovary. Petals rounded or obovate, large, convolute in the bud. Stamens 20 to 40; styles 3 to 5, united below or nearly to the top; stigmas oblong or linear: pod 3 to 5 celled, when opening, splitting into as many pieces. Seeds very numerous, attached to thick placentæ projecting from the axis. Leaves opposite, often toothed; no stipules; solitary, cymose; clustered, snowy white, or cream-colored flowers. There are several species, natives of the southern Atlantic and Pacific states and Japan, and several varieties have been produced by cultivation. *P. inodorus*, growing in the mountains of Virginia and southward, has ovate leaves, pointed, entire, or with some spreading teeth; flowers single or few at the ends of the branches; pure white, and inodorous. *P. grandiflorus* has larger flowers, and is a tall shrub with long recurved branches; grows in Virginia and southward, near the mountains. It is often cultivated in gardens. *P. hirsutus* grows in Tennessee and North Carolina. It has small, pointed, hairy leaves, and solitary flowers, or only two or three together. A species growing in Oregon, called *P. gordonianus*, is probably a variety of *hirsutus*. On the Pacific coast are also found *P. Californicus* and *P. Lewisii*. The most common and best representative of the genus, however, is *P. coronarius*, or the common mock orange or syringa much cultivated in gardens for a long time. Its native country is not known; it has been referred to Japan and also to southern Europe. It has erect branches, oblong ovate leaves, which when crushed have very much the odor and taste of cucumbers. Its cream-colored flowers, borne in large clusters, are well known for their exceeding fragrance.

PHI'LÆ, the name of a celebrated island lying in the midst of the Nile, s. of Syene, beyond the frontier of Egypt, in 24° 1′ 28″ n. lat. It was called by the Egyptians Pae-lak, the place of the cataract; or *Menuab*, the abaton or sanctuary; and by the Copts, pilak or "cataracts." It is a small granite rock, about 1000 ft. long, and 200 ft. broad, on which is placed a suite of buildings, not of the most remote antiquity, but distinguished for great architectural beauty. The oldest of these, consisting of a hypœthral or roofless hall, was built in the reign of Nectanebus I., 377–357 B.C. A second mention of the same monarch occurs on the first propylon, where a door, constructed in his reign, has been incorporated into the constructions by a later Ptolemy. Both these are dedicated to the goddess Isis, who in Philæ was venerated as Athor or the Egyptian Venus. The principal remains consist of the great temple of Isis erected by Ptolemy II. or Philadelphus, and continued by his successors, especially by Ptolemy III., Euergetes, 247–222 B.C.

The temple consists of a shrine or sekos, a pronaos, an open portico, and two pylons or gateways. Both of the propylons were constructed by Ptolemy VII., or Philometer, and Lathyrus; but the first was added to it by Ptolemy IX., or Euergetes II., 145–141 B.C. On the second pylon, the monarch is represented slaying the hostile nations. The colonnade was principally erected by Tiberius. The charming little temple, the Mastabat el Pharaoun, or Pharaoh's bed of the Arabs, was made in the reign of Trajan, 100 A.D. The temples are particularly important as containing the principal representations of the story of Osiris, his birth, bringing-up, death, and embalmment by Isis. Commenced in the reign of Nectanebus I., and continued by the Ptolemies and Romans, the worship of Isis lingered here till 453 A.D., or sixty years later than the edict of Theodosius. After the subjection of the Blemmyes to the Nubian Christians, the temple was converted into a church, and the paintings daubed with mud; and, in 577 A.D., the bishop Theodorus changed the pronaos of the temple of Isis into the church of St. Stephen; and a Coptic church, at a later period, was built out of the ruins. The whole area of the ancient temple was about 435 ft. long by 135 broad, in the center of the dromos. At the present day the island is deserted. It is a favorite resort of travelers ascending to Nubia, and is one of the best of the remaining ruined sites of ancient Egypt.

Pliny, N. H., v., c. 29. Servius, *Æneid*, v. 154; Jones and Goury, *Views on the Nile;* Wilkinson, *Modern Egypt*, ii. 295–303; Brugsch, *Reiseberichte aus Ægypten*, p. 256; Lepsius, *Reise*, p. 262.

PHILANTHROPY, a word formed from the Greek, and signifying the "love of mankind." In the history of German school education it has acquired a special meaning. The influence exercised by Rousseau was not less great on education than on politics, and was as visible in the pedagogues of Germany and Switzerland as in the men of the French revolution. It is to the brilliant and one-sided advocacy by the author of *Emile*, of a return to nature in social life and in the training of the young, that Basedow owed

his novel and enthusiastic educationalism. A brief notice of the institution, which was opened under his auspices at Dessau in 1774, and which was called *Philanthropin*, is given in the article on Basedow. Other establishments of the same kind were founded in different parts of Germany, but the only one which still survives is Salzmann's institute at Schnepfenthal, in Gotha, opened in 1784,

PHILARET (Basil Drozdoff), 1782–1867; b. at Kolouma; received his education in the theological seminary of Moscow; was tutor of Greek and Latin; appointed in 1806 preacher at the Sergian monastery of Troizka; transferred in 1810 to the academy of Alexander Newskj; in 1811 was made archimandrite; in 1812 became rector of the St. Petersburg theological academy; in 1817 was made bishop; and occupied successively the see of Twer, Iaroslaw, and Moscow. He remained in the see of Moscow, to which he was appointed in 1821, until his death. He was renowned for his eloquence, learning, statesmanship, and liberality of mind. The Russian rulers made him confidential adviser in all important questions. To him is ascribed the manifesto which led to the abolition of serfdom. In 1813 he received from Alexander I. a decoration for his oratory. Many of his sermons and lectures have been printed, and translated into foreign languages. His greatest work, the *History of the Russian Church*, published 1850–59, was introduced by order of the holy synod into the ecclesiastical seminaries. Besides this history and various commentaries, he published *A System of Christian Doctrines*, 2 vols. *The Liturgy of the Russian Church before the Invasion of the Mongolians; A Work on the Church Fathers*, 3 vols.; *An Outline of the Theological Literature of Russia.*

PHILATELY, the fancy for collecting and classifying postage-stamps. The word was formed in 1865 by M. Herpin from two Greek words, signifying love of that which frees from tax. Undertaken first as a pastime, useful in its relation to geography, philately has in twenty-five years grown to such an extent that more than seventy periodicals and catalogues on the subject are published, many philatelic societies have been established, and collections of stamps are valued at enormous sums; for example, the Galliera collection, at Paris, is said to have cost 1,440,000 francs. As an instance of the value of single stamps, a Brattleboro' stamp of 1846 is held by a London dealer at $1250.

Stamped or post-paid paper was used in Paris as early as 1653, when M. De Velayer established a postal system by means of envelopes franked by bonds of paper. In 1758, stamps similar to those now in use were introduced, but were seldom used, and were soon entirely forgotten. The next country to introduce stamps was Spain, in 1716; but these were used on official letters only, and at the beginning of this century were abandoned. Semi-official stamped envelopes were issued in Italy (Sardinia) in 1818. These also were little used, and were finally withdrawn in 1836. These stamps were octagonal in shape, with the device of a mounted post-boy. But practically the history of the postage-stamp begins in England with the reforms of Sir Rowland Hill. He proposed the use of an adhesive postage-stamp to the commissioners of the post-office inquiry, in Feb., 1837, and the plan was finally adopted, May 6, 1840. An adhesive stamp was made experimentally by Mr. James Chalmers in his printing-office, at Dundee, in 1834, but this was not made public by him till Nov., 1837; whereas Sir Rowland Hill proposed his stamp in February of that year. In 1840, Mulready's envelope was introduced, bearing an allegorical design of England attracting the commerce of the world; but after a few months this was superseded by the adhesive stamp. The design for the first stamp was made by Heath, of London, and was similar to that used at present. The first issue was a one-penny stamp, in black, and since then more than forty issues have been made, ranging in value from £5 to a halfpenny. The majority of the portraits of the Queen found on the English stamps were designed from a bust made over forty years ago. The only accurate portrait appears on the Canada revenue-stamp, and is taken from a photograph. Zurich was the first foreign country to issue stamps, in 1843, the other cantons following, from 1843 to 1849, when the Federal stamps were issued for the French and German cantons. These were current till 1854, when a uniform type, with values in centimes, rappen, and centesimi was introduced, replaced in 1862 by a new series bearing the name Helvetia. Postage-stamps were adopted in Brazil in 1843. The first issues were simply the values in large figures in an oval. Stamps bearing the portrait of Pedro II. were issued in 1866; superseded in 1890 by the stamp of the republic—five stars on a medallion—similar to an issue of 1887, but with the inscription U. S. of Brazil. Stamped envelopes were introduced in Russia in 1845. In 1856, adhesive stamps were issued in the province of Finland, a few months before the general issue for the empire in 1857. The Russian stamps bear the imperial eagle and crown, but never the head of the emperor. From 1858 to 1864, Poland issued stamps differing but little from those of the empire, but these are now obsolete. Many varieties of Russian local stamps exist, some of which are of curious designs and are very scarce.

Local stamps were in use in various cities in the United States as early as 1842—in New York, St. Louis, Baltimore, and Brattleboro'. The first stamp issued in New York was the City Dispatch, followed shortly by many others; the best known of these New York locals is Hussey's, which was issued as late as 1882. The first general issue was made in 1847, in two values of five and ten cents, bearing respectively the heads of Franklin and Washington. These were replaced in 1851 by three new values—one, three, and twelve cents—the five-cent stamp of this issue bearing the head of Jefferson. From this time to

1860 a complete series was issued, in values from five to ninety cents. A new set was issued in 1861, with slight changes; and in 1869 an entirely new series was brought out in various designs: a horseman, locomotive, eagle, steamship, Landing of Columbus, Declaration of Independence, and heads of Franklin, Washington, and Lincoln. The series of 1870 to 1872 bore heads of Franklin, after Rupricht's bust; Jackson, after Powers; Washington, after the bust by Houdon; Lincoln, after Valk; Stanton, from a photograph; Jefferson, after Powers's statue; Clay, after the bust by Hart; Webster, after the Clevinger bust; Scott, after the bust by Coffee; Hamilton, after Cerrachi, and Perry, from Wolcott's statue. In 1875 a five-cent stamp was issued for foreign postage, bearing the head of Jackson, taken from a photograph; and in 1882 another of the same value, with the head of Garfield, after a photograph. The issue of 1888 was the same as that of 1872–83. The stamps of the issue of 1890 are smaller than those formerly used, and bear the heads of Franklin, Washington, Jackson, Lincoln, Garfield, Jefferson, and Perry, after the designs previously used, with the addition of the heads of Webster and Clay, after daguerreotypes, and of General Grant, after a photograph. Stamped envelopes were introduced in 1853, engraved by Nesbitt & Co., of New York, in values from one to forty cents, and bearing profiles of Washington, Franklin, and Jackson. In 1870 the contract was given to G. H. Reay, who brought out eleven values—from one cent to ninety—with a separate design for each, in addition to the three already in use—the profiles of Lincoln, Jefferson, Clay, Webster, Scott, Hamilton, Perry, and Stanton. Since 1874 stamped envelopes have been manufactured by the Plimpton Company, of Hartford.

An interesting series of special stamps are the official stamps of the various departments: Executive, Interior, Justice, Navy, War, State, Treasury, Agriculture, and Post-Office. These are of the same design as the general issue, with the name of the department above, with the exception of the Post-Office stamps, which bear numeral of value and official stamp in oval, with name of department above. Newspaper and periodical stamps for the use of publishers were issued in 1865, and range in value from one cent to sixty dollars. The stamps are of elaborate designs and beautiful workmanship, but never pass through the mails, being cancelled and kept in the Post-Office Department as vouchers for postage paid. In 1893, a special series of large stamps in honor of the Columbian celebration appeared.

In 1879 postage-due stamps were introduced. These are all of one color—red-brown—and vary only in the numerals of value—from one to fifty cents. Seal stamps are issued for packets of registered letters and for unsealed letters. The most recent stamp is the special delivery stamp, issued first in 1885. The design is a messenger-boy, and the value is ten cents. This brief review of the history of postage-stamps in the United States would hardly be complete without a reference to the use of postage-stamps as currency during the war. In 1862 silver and small change had disappeared from circulation, and their place was filled in great measure by postage-stamps, which later were put up in small envelopes, with amount printed outside. Finally, the stamp was enclosed in a thin brass case, with a front of mica showing the stamp. These were superseded by the government issue of stamps printed in the form of small bank bills, and known as postage currency.

Among the most historical stamps are those issued by the Confederate states during the war. Provisional stamps were issued in 1861 by the post-masters of the various towns; and these poorly-made stamps and envelopes, often of no better material than wall-paper or newspaper, tell the story of the sufferings and privations of those days. The general issues were made in 1861 to 1863, bearing heads of Confederate leaders, and ranging in value from two to twenty cents.

Stamps were introduced into France by the republic in 1849. The first series bore the head of the goddess of Liberty. The next series, issued in 1852 by the presidency, bore the head of Napoleon. The stamps of 1853, after the establishment of the empire, bear the same device, but the inscription is changed to Empire Français. In 1863, a laurel wreath was added to the head of Napoleon. These were current till the fall of the empire, in 1870, when the republic issued a new set similar to those of 1849. In 1876, the present design of two full-length figures was introduced and used in all subsequent issues. The special stamps for the French colonies represent a seated figure leaning on an anchor.

Stamps were issued in Belgium, in 1849, bearing the bust of King Leopold I. in uniform. Since that time there have been more than fifteen issues, all showing the national arms, or portrait of the sovereign. The first stamp used in Germany was issued in Bavaria in 1849. This was a plain, inartistic stamp, and was replaced in 1867 by one bearing the royal arms. The first Prussian stamp was issued in 1850, bearing the bust of the king, and followed in 1861 by the Prussian eagle. Stamps were issued by the smaller German states from 1850 to 1868, when all were replaced by the stamp of the North German Confederation. This, in 1871, gave place to the stamp of the German empire. At present only Bavaria and Würtemberg retain their special postage-stamps. The first Austrian stamp appeared in 1850, and bore the imperial arms. The emperor's head appeared first in 1858, and from that time alternates with the imperial eagle. Special stamps for Hungary were issued in 1868. The postal-card originated in Austria, and appeared in 1869.

Stamps appeared in Italy (Sardinia) in 1851, bearing the head of the king, and in the other states, as follows: In Modena, Parma, and the Roman states in 1852, and in the Two

Sicilies in 1858 and 1859. These were gradually replaced by the stamp of Italy, as the states were united.

Stamps were introduced in Spain in 1850. With the exception of one year, when the royal arms were substituted, every issue bore the portrait of Isabella II., till her dethronement in 1868. In 1870 a new series was issued, with the head of the goddess of Iberia. In 1872 this was replaced by the portrait of Amadeus, followed by that of Alfonso XII., in 1875; and in 1889 the head of the present young king appeared. There is also an interesting series of Carlist stamps, issued from 1873 to 1875.

Stamps were introduced in the smaller European countries in the following order: Denmark, 1851; Netherlands, 1852; Portugal, 1853; Norway, 1854; Sweden, 1855; Roumania, 1858; Romagna, 1859; Malta, 1860; Greece, 1861; Turkey, 1863; Servia, 1866; Heligoland, 1867; Azores, 1868; Iceland, 1873; Montenegro, 1874; San Marino, 1877; Bulgaria, 1879; Cyprus, 1880; Eastern Roumelia, 1881; Gibraltar, 1886, and Monaco, 1885.

The first stamps used in Asia were introduced in 1850, in the Scinde districts, under the administration of Sir Bartle Frère. The following table gives the date of the introduction of postage-stamps in the different countries of Asia:

YEAR.	Countries.	YEAR.	Countries.
1854....	India.	1880....	Rajpepla, Nabha.
1857....	Ceylon.	1881....	Nepaul.
1862....	Hongkong.	1882....	Bangkok.
1865....	Kashmir, Jummoo, Shanghai.	1883....	Macao, Siam, Timor.
1866....	Hyderabad (Deccan).	1884....	Pountch, Puttiala.
1867....	Straits Settlements.	1885 ..	Corea, Gwalior.
1868....	Afghanistan.	1886....	Holpar, Chamba, Cochin China.
1871....	Japan, Portuguese India.	1887....	Jhalawar.
1873...	Surinam.	1888....	Annam and Tonquin, Travancore, Wadrohan, Formosa.
1875....	Punjaub (Ihind), Persia, China.	1889....	Indo-China.
1877....	Alwur, Bhopaul, Nowanugger, Soruth.	1890 ...	Bamra.
1878....	Talcher.		
1879 ...	Bhore, Faridkot, Sirmoor.		

The following table gives the dates for Africa:

YEAR.	Countries.	YEAR.	Countries.
1847....	Mauritius.	1874....	Griqualand, Lagos.
1852....	Reunion.	1875....	Gold Coast.
1853....	Cape of Good Hope.	1877....	Mozambique, Cape Verde.
1856....	Corrientes, St. Helena.	1879 ..	Guinea.
1857....	Natal.	1884....	Madagascar, Stellaland.
1860....	Liberia.	1886....	British Bechuanaland, Congo, Gabou, New Republic.
1861...	Sierra Leone.	1887....	Senegal
1866....	Egypt.	1888 ...	British Protectorate, Tunis, Zululand.
1868....	Fernando Po, Madeira, Orange Free State, Suez Canal Company.	1889....	Madagascar (French), Swazieland, Nossi Bé.
1869....	Gambia, St. Thomas, Prince's Island.	1890....	Seychelles Islands.
1870....	Angola, South African Republic.		

The dates for Oceanica are.

YEAR.	Countries.	YEAR.	Countries.
1850...	New South Wales, Victoria.	1864....	Dutch Indies.
1851 .	Hawaiian Islands.	1869 ...	Sarawak.
1853....	Tasmania.	1871....	Fiji Islands.
1854 ...	Philippine Islands.	1877....	Samoa.
1855....	New Zealand, West Australia, South Australia.	1882....	Tahiti.
1858....	New Caledonia.	1883....	British North Borneo.
1861....	Queensland.	1886....	Tonga.

Table for South America:

YEAR.	Countries.	YEAR.	Countries.
1850...	British Guiana.	1865....	Honduras, Ecuador, British Honduras.
1852....	Chili.	1867...	Salvador, Bolivia.
1856....	Uruguay, Mexico.	1870....	Paraguay.
1857....	Peru.	1871....	Guatemala.
1858 ...	Buenos Ayres, Argentine Republic.	1873....	Surinam.
1859....	Colombian Republic, Venezuela.	1878....	Falkland Islands, Panama.
1862....	Nicaragua, Costa Rica.	1886...	French Guiana.

Table for West Indies:

YEAR.	Countries.	YEAR.	Countries.
1851....	Trinidad.	1865....	Bermuda.
1852....	Barbadoes.	1867....	Turk's Island, Virgin Islands.
1855....	Danish West Indies, Cuba.	1870....	St. Christopher.
1858....	Jamaica.	1873....	Porto Rico, Curaçoa.
1859....	Bahamas, St. Lucia.	1874....	Dominica.
1860....	Grenada.	1876....	Montserrat.
1861....	Nevis, St. Vincent.	1879....	Tabago.
1862....	Dominican Republic	1881....	Hayti.
1863....	Antigua.	1884....	Guadeloup.
1864....	St. Thomas.	1886....	Martinique.

Stamps were first used in Canada, 1851, and in New Brunswick in the same year; in Newfoundland and Nova Scotia in 1857; in 1860 in Prince Edward's Island (and in British Columbia and Vancouver Island in 1861). In 1868 all these postal departments were consolidated, and one set of stamps, in values from one to fifteen, was issued for the whole Dominion.

The French possessions, St. Pierre and Miquelon, issued stamps in 1885.

An interesting feature of philately is the surcharged stamp, issued by various governments to supply a temporary lack of regular issues; and as they became comparatively rare in a short time they increased largely in value. Especially interesting are the early surcharges of Barbadoes, Cuba, Fiji Islands, Mauritius, Natal, etc. It is probably to Mauritius that we owe the idea of surcharging new values. In 1858, the post-master, needing a fourpenny stamp, placed that value on a shilling stamp, and the custom was quickly followed by other countries.

In conclusion, a short account of the manufacture and distribution of postage-stamps in the United States may prove interesting. The white paper on which the stamps are printed is first counted at the paper-mill, then shipped to the government office connected with the manufactory, where it is counted twice by government employés and stored. The contractor takes each day the required number of sheets, counting them again twice. Two hundred stamps are printed on each sheet; the sheets are then sent to the drying room. The next process is gumming, which is done by an automatic machine, which not only thoroughly gums, but dries the sheets. Each sheet is then placed between pasteboards, and for several hours subjected to heavy pressure. They are counted again, and sent to the perforators, who first divide each sheet into two, of one hundred stamps each, and then perforate them in the spaces between the rows. These sheets are again pressed, then counted and made into packages of 2000 sheets (200,000 stamps). The stamps are then counted by two persons and placed in the vault ready for circulation. All spoiled sheets are cancelled and forwarded to Washington for destruction.

Post-masters send their requisition for stamps to Washington; small offices being replenished once in three months, larger ones once in six weeks. The New York office orders from 18,000,000 to 20,000,000 about every 15 or 20 days The number of stamps issued for the year ending June 30, 1890, was 2,225,000,000.

PHILBRICK, John Dudley, ll.d., b. N. H., 1818; educated at Dartmouth, and after graduating in 1842, taught school for many years. In 1853 he became principal of the Connecticut normal school; in 1855 superintendent of schools in that state, and in 1857 superintendent of the Boston public schools. He was sent to the Vienna exposition of 1873 as educational commissioner from Massachusetts, and acted as a member of the international jury. After his return he became president of the national teachers' association, was officer of many educational societies, wrote many papers on the subject, and edited the Connecticut *Common School Journal* and the *Massachusetts Teacher*. He d. 1886.

PHILEMON, b.c. about 360–262, b. Soli, Cilicia; settled at Athens in early youth; became the rival of Menander in dramatic writing. His comedies found in all the best editions of Menander, are distinguished for lively wit, which gained them much popular favor, and for ingenuity, and skill in delineating character. They numbered 97 titles; 53 of which have been preserved in the *Bibliotheca Græca*, of Fabricius. He is said to have retained a peculiarly sunny temper throughout his long life, and the popular belief is that he died laughing at a ludicrous incident. He began to place his plays on the stage before the 113th Olympiad. He died in the reign of the 2d Antigonus son of Demetrius. The best edition of his works is that of Meineke, Berl., 1823, *Theatre of the Greeks*. His son Philemon the younger, was a comic poet and wrote 54 comedies.

PHILE'MON AND BAU'CIS, according to a classic myth, finely poetized by Ovid in his *Metamorphoses*, were a married pair, remarkable for their mutual love. Jupiter and Mercury, wandering through Phrygia in human form, were refused hospitality by every one, till this aged pair took them in, washed their feet, and gave them such humble fare as they could provide. On going away, the gods took them with them to a neighboring mountain, on looking from which they saw their village covered with a flood, but their own cottage changed into a splendid temple. Jupiter permitted them to make any request they chose, but they only asked to be servants of his temple, and that they

might die at the same time. When, accordingly, they were seated at the door of the temple, being now of great age, they were changed, Philemon into an oak, and Baucis into a linden. They felt the change taking place, and so long as the power remained with them, looked most tenderly upon one another.

PHILEMON, EPISTLE OF PAUL TO, is the shortest of the four extant letters which the apostle wrote from Rome during his captivity. We either directly learn, or legitimately infer from its contents, that Philemon, who probably lived at Colossæ, was a man of considerable wealth, the head of a numerous household, and liberal to the poor. He had possessed a slave called Onesimus, who had run away from him, after—it has been thought (verse 18)—robbing or defrauding him. Onesimus, however, coming to Rome, had been brought into contact with Paul, and converted to Christianity. At first the apostle thought to retain him as his personal attendant, for he was now, as he tells us (verse 9), "Paul the aged;" but on further consideration, he resolved to send him back to his former master. The epistle is simply a brief letter, begging Philemon to pardon Onesimus, and to receive him "not now as a servant, but above a servant, a brother beloved." It exhibits an exquisite tenderness and delicacy of feeling, with all that tact and subtlety of address by which Paul was wont to find his way into the innermost heart of men. The historical evidence of its authenticity is complete. Even Baur has remarked that modern criticism in assailing this particular book runs a greater risk of exposing itself to the imputation of an excessive distrust—a morbid sensibility to doubt and denial—than in questioning the claims of any other epistle ascribed to Paul.

PHILIP, the Apostle, of Bethsaida, one of the earliest disciples of Christ; was distinguished by his confident testimony to Nathanael, and his successful plea with him, notwithstanding his prejudice against Nazareth, to come and see Jesus and judge for himself; was chosen one of "the twelve;" was questioned by the Lord, prior to the feeding of the 5,000, to test his faith; and again, before the crucifixion, to increase his knowledge; was joined with Andrew in bringing Greek inquirers to Jesus; and was one of "the eleven" in their assemblage after the resurrection and at pentecost. The traditionary notices of him are numerous; but some of them confound him with Philip the evangelist, and the rest are uncertain or false.

PHILIP THE MAGNANIMOUS, Landgrave of Hesse, 1504–67, b. Marburg; succeeded his father, William II., in 1509, his mother being made regent. He was one of the first to adopt the cause of the reformation, and was a member of the Smalcald league defeated by Charles V., 1546, in the battle of Mühlberg. Philip was retained as a prisoner, but released on the demand of his son-in-law, Maurice of Saxony. He was married in 1523 to a daughter of George the Bearded, duke of Saxony, and by her had four sons between whom he divided his landgraviate. But a secret marriage to Margaret von der Saale, a Protestant, in 1540, was assented to by Luther and Melanchthon on the ground that the former marriage was adulterous.

PHILIP II., King of Macedonia, and father of Alexander the Great, was b. at Pella in 382 B.C. He was the youngest son of Amyntas II. and Eurydice. At Thebes, whither he was taken as a hostage by Pelopidas, he spent part of his early life, employing his exile in studying the art of war, and the constitution and laws of the Greek states, as well as the literature and the character of the people—pursuits which were of the greatest service to him afterward, when called on to administer the government of the Macedonian kingdom. The assassination of his eldest brother, Alexander II., by Ptolemy Alorites, after a short reign of two years (369–367 B.C.), and the death of his second brother, Perdiccas III., in battle (360 B.C.), placed him at the head of affairs in Macedonia, as guardian to his nephew Amyntas, still an infant. In a few months Philip made himself king, the rights of Amyntas being set aside. Dangers soon beset him from without and from within. The Illyrians and other neighboring tribes assailed his kingdom on different sides; while two pretenders to the throne, urged on by the Athenians and Thracians, stirred up civil commotion. But foreign and domestic enemies soon disappeared before the decision, the energy, and the wise policy of the young king. In the brief space of a year he had secured the safety of his kingdom, and had gained for himself a dreaded name. At this time he was only 24 years of age. Henceforward his policy was one of aggression, and his every thought was directed to the extension of his empire and the spread of Macedonian influence. The Greek towns on the coast of Macedonia were the first objects of attack. After possessing himself of Amphipolis and Pydna, by means little consistent with the faith of treaties, he handed over to the Olynthians the city of Potidæa, which he had taken from the Athenians. In Thrace he captured the small town Crenides, which, under its new name, PHILIPPI, soon acquired great wealth and fame, and ultimately became celebrated in profane as well as in sacred history. The surrounding district was rich in gold-mines, which proved a source of great revenue to Philip (about $1,000,000 annually), and supplied him plentifully with the means of paying his armies, of bribing traitorous Greeks, and of opening the gates of many cities, the sieges of which might otherwise have cost the blood of thousands. After a few years of comparative leisure, he turned his ambitious views southward; and capturing Methone (at the siege of which he lost an eye), he advanced into Thessaly, and ultimately to the strait of Thermopylæ, which, however

he did not attempt to force, as it was strongly guarded by the Athenians. He therefore returned into Macedonia, and directed his arms against the Thracians, waiting for a more fitting occasion to carry out his darling project. Such an opportunity was not long wanting. After capturing all the towns of Chalcidice—the last of which was the important city of Olynthus—he made peace with the Thracians, and next year with the Athenians, who had been at war with him in defense of their allies the Olynthians. It was this siege of Olynthus by Philip which called forth these Olynthiac orations of Demosthenes, which are still admired as efforts of oratorical genius hitherto unequaled in any country. Philip was now requested by the Thebans to interfere in the war ("the sacred war") which was raging between them and the Phocians. He marched into Phocis, destroyed its cities, and sent as colonists to Thrace many of the inhabitants (346 B.C.). The place which the Phocians had occupied in the amphictyonic council was transferred to Philip, and he was appointed, jointly with the Thebans and Thessalians, as president of the Pythian games. His next step was to secure a footing in the Peloponnese, by espousing the cause of the Argives, Messenians, and others, against the Spartans. In 339 B.C. the amphictyonic council declared war against the Locrians of Amphissa; and, in the following year appointed Philip commander-in-chief of their forces. The Athenians were alarmed at his approach into Greece in this capacity, and formed a league with the Thebans against him; but their united army was utterly defeated at the battle of Chæronea (338 B.C.), and all Greece was at the feet of the conqueror. He was now in a position to enter on the great dream of his later years—viz., to invade the Persian empire, and revenge the injuries of Greece. Deputies from the different states of Greece assembled in congress at Corinth; and after resolving to make war on the Persian king, chose Philip as leader of their armies. Preparations were in progress for this great expedition when he was suddenly cut off by the hand of the assassin Pausanias, at a festival celebrating the marriage of his daughter with Alexander of Epirus (336 B.C.). A private grudge at Philip, for neglect to punish an insult offered to Pausanias by Attalus, was said to be the motive which inspired the murderer, though suspicion is not wanting that the deed was done at the instigation of Alexander and his mother Olympias, who had retired from the court in disgust at Philip's marriage, the year previous, with Cleopatra, daughter of Attalus, one of his generals. Philip was a man given to self-indulgence and sensuality; he was faithless in the observance of treaty obligations, and unscrupulous as to the means by which he gained his ends; but he had to deal with factious and faithless opponents, which may help to explain if it does not justify his policy; while his clemency as a victor has won the admiration even of the virtuous Cicero, who pronounces him "always great." Of his force and energy of character, his acuteness, fertility of invention, and eloquence, it is impossible to speak too highly. He was at the same time a lover of learning and a liberal patron of learned men. He reigned from 359 to 336 B.C.

PHILIP III., King of Macedon. On the death of Alexander the Great at Babylon in 323 B.C., the army elected as king, under the name of Philip III., Arrhidæus, son of Philip and Philinna of Larissa, one of his many wives. He was a youth of weak understanding, and was totally unfit for the duties of government. His wife Eurydice (daughter of Amyntas, son of Perdiccas III.), whom he married in 322 B.C., endeavored, on their return to Macedonia, to oppose the measures of Polysperchon and Olympias in support of the young Alexander, posthumous son of Alexander the Great and Roxana. But her army was defeated; she herself was taken prisoner; and, along with her husband, was put to death in 317 B.C.

PHILIP V., King of Macedon, B.C 237–179: b. Macedonia; grandson of Antigonus Gonnatas; ascended the throne 220 B.C., on the death of his uncle Antigonus Doson. His reign began with the disturbances between the Ætolian and Achæan leagues, in which he aided the latter, and he was distinguished for activity and military skill. He carried on a successful war with Rome, called the first Macedonian war (B.C. 210–205), unassisted by Hannibal, whose offers of alliance he slighted. In 200 the second Macedonian war began; ending in 197, during the reign of his son Perseus, in the complete discomfiture of the Macedonian army by Titus Quintius Flaminius at Cynoscephalæ. The country sank into subjection to Rome, surrendering all its possessions in Europe and Asia; their fleet being seized by their conquerors, and tribute exacted. His death took place just before the last crisis.

PHILIP II., King of Spain, the only son of the emperor Charles V. (q.v.) and Isabella of Portugal, was b. at Valladolid, May 21, 1527. He was brought up in Spain, and carefully educated under the superintendence of able tutors, by whose instructions he greatly profited, becoming an accomplished linguist and mathematician, and a connoisseur in architecture and the fine arts. But all attempts to indoctrinate him with the chivalric ideas of the time were utterly futile. From his very childhood he was distrustful and reserved; he invariably spoke with slowness and an air of deep reflection which was too marked to be wholly real, and exhibited in his manners a *sang-froid* which even in his early years was rarely disturbed by ebullitions of passion. While still very young he was intrusted, under the direction of a council, with the government of Spain, and in 1543 he espoused Mary of Portugal, who died three years after. In 1548 he went to join his father at Brussels, and there adopted the multitudinous equipage

and minute and pompous etiquette of the late Burgundian court, which from this time he retained. While at Brussels, Philip was presented to his future subjects, and was at the same time fully initiated into his father's policy, the two chief items of which were the maintenance and extension of absolute rule throughout his dominions, and the support and propagation of the Catholic religion. In 1554 he married Mary Tudor, queen of England, and to gain the support of that country to his political projects, and at the same time restore it to the Roman Catholic pale, he laid aside his ordinarily cold and haughty demeanor, and labored to ingratiate himself with his wife's subjects, taking the utmost care to avoid exciting the national jealousy of foreign influence. But his plans were discovered and frustrated, and this disappointment, combined with the annoyance to which he was subjected by the jealousy of his wife, prompted him to leave England (which he did forever), and return to Brussels (Sept., 1555). In the following month he became, by the abdication of his father, the most powerful potentate of Europe, having under his sway, Spain, the two Sicilies, the Milanese, the Low Countries, Franché Comté, Mexico, and Peru; his European territories being more fertile, and their inhabitants more wealthy and prosperous than any others on the continent, while his army was the best disciplined, and headed by the greatest generals of the age. The treasury alone was deficient, having been drained by the enormous expenditure of his father's wars. Philip was eager to begin the crusade in favor of Catholicism, but he was compelled to postpone it, owing to a league which had been formed between France, the pope, and the sultan, to deprive him of his Italian dominions. He soon got over his religious scruples at engaging in warfare with the pope, and intrusted the defense of the Sicilies to Alba (q.v.), who speedily drove out the pope and the French, and conquered the papal territories, while Philip himself vigorously prosecuted the war against France in the n., and defeated the French at St. Quentin (q.v.) (Aug. 10, 1557) and Gravelines (July 13, 1558). These reverses forced the French (the pope having already made a separate treaty) to agree to terms of peace at Chateau-Cambresis (April 2, 1559.) Philip's wife was now dead, and after an unsuccessful attempt to obtain the hand of her successor, queen Elizabeth, he espoused Isabella of France, and returned to Spain, where from this time he always resided. Before leaving the Low Countries, he solemnly promised to withdraw almost the whole of his Spanish troops who preyed upon the peaceful Flemings, but he firmly refused to annul or modify the rigorous edicts of his father against heretics. His realm being now at peace, he resolved, as a necessary preliminary to the carrying out of his great proselytizing scheme, to replenish his treasury, a thing impossible without forced contributions, which, at that time, could only be obtained in those countries over which he held absolute rule—viz., Spain and America. He therefore set about establishing absolute government in those of his states that were in possession of something like free institutions, and with this view sought to introduce the inquisition into the Low Countries and Italy. But the introduction of this instrument of tyranny was successfully resisted in Naples and the Milanese; in Sicily its powers were so shackled as to render it quite a harmless institution; but these failures only stimulated him the more to establish it in all its pride and power in the Low Countries. For a number of years it continued in vigorous action in that country; but the natural result of such a course of conduct was a formidable rebellion of all classes, Catholic and Protestant, which was partially successful—the northern portion (the "seven united provinces") establishing its independence in 1579. In this conflict the resources of Spain were largely expended, and to replenish his treasury in the speediest manner possible, Philip exacted enormous contributions from Spain, abolishing all special communal or provincial privileges and rights which might interfere with his actions, and suppressing all insurrection and discontent by force of arms or the inquisition. During the first half of his reign he engaged in a desultory warfare with the Barbary corsairs, who were supported by the Turks—the only memorable incident of which was the famous naval victory of Lepanto (q.v.), won Oct. 7, 1571. In 1580 the direct male line of Portugal having become extinct, Philip laid claim to the throne, and after the duke of Alva had occupied the kingdom with an army, the Spanish monarch's title was recognized by the Portuguese estates. His enmity to England on account of the anti-Spanish policy of queen Elizabeth incited him to attempt the conquest of that country, but his most formidable attempt failed signally. See Armada. After the accession of Catharine de Medicis to power, France and Spain drew closer the bonds of amity which had previouly subsisted between the two countries; but the refusal of Catharine to adopt Philip's plans for the wholesale slaughter of heretics produced a coolness in their relations. However, when Henry, king of Navarre, a Huguenot, became heir-presumptive to the throne, Philip allied himself with the Guises and the other chiefs of the Catholic party who were in rebellion, and his obstinate persistence in these intrigues after the cause of the Guises was shown to be hopeless, prompted Henry to declare war against him. The Spaniards had the worst of it, and Philip was glad to conclude the treaty of Vervins May 2, 1598. He died in the Escurial at Madrid, on Sept. 13 of the same year. His third wife, Isabella, d. in 1568, and his fourth, Anne of Austria, who was also his niece, whom he married 1570, d. in 1580. Philip had great abilities, but was visionary, and overtasked his resources, without leading to any good or profitable result. No single kingdom in Europe could have stood against him, but he was always at war with at least two at a time; and even the splendid opportunity which the extinction of the direct Capetian

line in 1589 gave him for uniting France, Spain, and Portugal in one great monarchy, could not restrain this unfortunate peculiarity. His fanatical enthasiasm for Catholicism, in which he was surpassed by no man who ever lived, and the zeal with which he persecuted all heretics through the inquisition, combined with the odious tyranny of his secular government to degrade Spain, by breaking the proud and chivalrous spirit which had been the source of its pre-eminence among European nations, while his virulent persecutions of the industrious Moriscoes, and his oppressive exactions, put a stop to the commerce of the country. By his fourth wife, Anne of Austria, he had a son, Philip III., whose daughter, also Anne of Austria, married Louis XIII. of France.

PHILIP V., King of Spain, and the founder of the Bourbon dynasty in that country, was the second son of the Dauphin Louis (son of Louis XIV.) of France, and was born at Versailles, Dec. 19, 1683. The last king of Spain of the Hapsburg dynasty, Charles II., had successively promised the succession to the throne to Charles, archduke of Austria, the great grandson of Philip III. of Spain, and to Philip, then duke of Anjou, the son of his own eldest sister; but becoming cognizant of a secret treaty which had been agreed to between England, France, and Holland for the partition of Spain, he, to prevent the dismemberment of his kingdom, left by will the succession to Philip of Anjou. France immediately seceded from the partition treaty, and, on the death of Charles II. in 1700, Philip, who was the favorite candidate among the Spaniards, with the exception of those in the eastern provinces, took possession of the kingdom (April 21, 1701); and, to gain over Savoy to his side, and thus create a diversion in Italy against Austria, he married Maria Louisa, daughter of Victor Amadeus. War almost immediately broke out between the rival claimants, Charles being supported by the "grand alliance," which included England, Austria and Holland, and subsequently (January, 1702) Prussia, Denmark, and Hanover (May, 1703), Portugal, and (October, 1703) Savoy. See SUCCESSION WARS, SPANISH. The fortune of war was mostly on the side of the allies; but France and Spain carried on the contest heroically, and, though at great sacrifices, the throne was secured to Philip by the peace of Utrecht (April 11, 1713). In the following year the queen died, and Philip espoused Elizabeth Farnese of Parma, who immediately induced her husband to commit the reins of government to Alberoni (q.v.); in fact, so much was the weak-minded king under the influence of his talented young wife, that he granted everything she asked. "He was," says Sismondi, "remarkable for good nature, he had few faults and as few virtues, his sentiments were just and honorable, but he was wholly deficient in energy; he had no taste for anything beyond devotional exercises and the chase; he was made to be governed, and he was so all his life." Alberoni's adventurous foreign policy, which at first succeeded in restoring the Spanish rule in Sicily and Sardinia, brought down upon Spain the wrath of the quadruple alliance (France, England, Holland, and Austria), and war was only averted by his being dismissed; but his dismissal was really produced by his neglecting to further the queen's pet scheme of providing sovereignties in Italy for her sons, who seemed to have little chance of obtaining the throne of Spain. The strong bond of union which had hitherto subsisted between Spain and France was broken, in 1725, by the refusal of the regent of the latter country to fulfill certain matrimonial agreements; but four years afterward the two countries joined with England and Holland against the emperor, and in 1731 Philip took measures to recover the old Spanish possessions in Italy. The war which followed at last satisfied the queen by giving the kingdom of the two Sicilies to her son Charles (1736), but Philip, in attempting to obtain still greater advantages over Austria, was led into a war of which he was not destined to see the result. He died at Madrid, July 9, 1746.

PHILIP, KING, Sachem of Pokanoket; d. 1676; named by the English Philip, though his Indian name was Pometacom. He became sachem in 1662, and the same year he went to Plymouth, and promised to continue friendly to the colony, and not to cede any territory without their knowledge. About 1670 his friendly intentions began to be suspected, frequent meetings of the tribes were held, murders of whites became frequent, and in 1671 it was attempted to disarm the Indians. But the war did not break out till 1675. An Indian convert named Sassamon, divulged to the colonists the preparations made by Philip, and was murdered. In revenge for the execution of his murderers, the Indians killed 8 or 9 men, and open hostilities were begun. The Indians did not venture to meet the colonists in battle, but burned settlements, laid ambuscades for the settlers, and killed the stragglers. In Dec., 1675, Josiah Winslow led a force of 1000 men against the Narragansetts, with whom Philip had formed an alliance, took by storm a fort said to have contained 4,000 Indians, and destroyed their village. The war went on for the first 6 months of 1676, but Philip's power was soon broken, he was tracked to Mount Hope, where a force under Capt. Church attacked him, and he was killed by an Indian in attempting to escape. His body was quartered, and his head sent to Plymouth, where it was kept on a gibbet for 20 years. During this war 600 colonists were killed, 600 buildings burned, and 13 towns destroyed. Its cost was estimated at $1,000,000. Plymouth and Massachusetts Bay suffered heavily.

PHILIPPE II., better known as PHILIPPE AUGUSTE, King of France, was the son of Louis VII. and Alix of Champagne, and was b. in Aug., 1165. He was crowned, in 1179, during the life of his father, succeeded him in 1180, and proved one of the great-

est monarchs of the Capetian dynasty. His marriage with Isabella of Hainault, a descendant of the Carlovingians, established more completely the right of his family to the throne of France. He first made war upon the count of Flanders to obtain the districts of Vermandois, Valois, Amienois, and Artois, which belonged to his wife, and, after various fortunes, obtained Amienois and part of Vermandois at once, and the rest after the count's death in 1185. By the advice of St. Bernard (q.v.) he rigorously punished heretics, despoiled the Jews, absolving their debtors of all obligations, excepting one-fifth, which he transferred to himself; put down with vigor the numerous bands of brigands and priest-haters who devastated the country and burned the churches and monasteries, compelling their chief leader, the duke of Burgundy, to submit (1186) to his authority—acts which gave him great popularity among his subjects. He sustained the sons of Henry II. of England in their rebellions against their father, and conquered, in conjunction with Richard Cœur-de-Lion, many of the English possessions in France. After the accession (1189) of Richard to the throne, Philippe and he set out together on the third crusade; but quarreled while wintering in Sicily, and this dissension continuing, Philippe, after a sojourn of 3½ months in Syria, set out (July 31, 1190) on his return to France, after taking a solemn oath to respect the integrity of Richard's dominions; but no sooner had he returned than he entered into an arrangement for the partition of Richard's territories in France with his unworthy brother John. Some acquisitions were made, but Richard's sudden return overset the calculations of the conspirators, and a war immediately commenced between the two monarchs, in which Philippe had at one and the same time to defend his territories from the English, and the counts of Champagne, Boulogne, Bretagne, and Hainault, who attacked them on all sides. In order to obtain money, he was obliged to rescind his edicts against the Jews; but the mediation of Pope Innocent put an end (Jan. 13, 1199) to a war which was productive of no other result than the exhaustion of the strength of the combatants. Richard of England died within two months after; but war almost immediately recommenced with England, regarding the respective claims of king John of England and his nephew Arthur of Bretagne to the French heritage of Richard Cœur-de-Lion, which consisted chiefly of Anjou, Maine, and Touraine. Arthur had applied for aid to Philippe, and the French king immediately responded by causing the young duke to be recognized in the above-mentioned provinces; but a quarrel in which he became involved with the pope on account of his having divorced his second wife, Ingelburga of Denmark, to marry Anges of Meran, a Tyrolese princess, compelled him to leave the English in possession for a little time longer. The defeat, capture, and subsequent murder of Arthur, however, again brought him into the field. The English provinces in France were attacked by the combined French and Bretons: Normandy and Poitou, with the three disputed provinces, were annexed to France; and the English dynasty in Bretagne dispossessed by a French one (Oct. 26, 1206). During 1211–14 Philippe engaged in a war with king John of England and emperor Otho of Germany, who were leagued against him, in which he was mostly successful. During the rest of his reign, Philippe was occupied in consolidating his new possessions, and took no part either in the war with the Albigenses or that in England, though his son Louis (Louis VIII. See Capetian Dynasty) went to the latter with an army. Philippe succeeded in establishing the unity of his dominions, and in emancipating the royal authority from the trammels of the papacy and clergy, and vindicated his sovereign authority over the latter as his subjects, irrespective of the pope. His measures, without alienating the great feudal lords, tended firmly to establish his authority over them, and to emancipate the larger towns from their sway. To increase the unity of the kingdom, and strengthen the central power, he established at Paris a chamber of 12 peers, 6 lay and 6 ecclesiastical, who almost always supported his plans, even against the court of Rome. Finally, he largely improved and embellished Paris, built many churches and other institutions, and encouraged commercial associations ; he also fortified many of the chief towns, including the capital. He died at Mantes, July 14, 1223.

PHILIPPE IV., surnamed *Le Bel* or "Fair," King of France, the son of Philippe III., king of France, and Isabella of Aragon, was b. at Fontainebleau in 1268, and succeeded his father in 1285. By his marriage with queen Joanna of Navarre, he obtained Navarre, Champagne, and Brie. For several years he carried on a struggle with the count of Flanders to obtain possession of that country, and also seized Guienne from the English; but was, in the end, obliged to restore Guienne and Flanders beyond the Lys. The great events of Philippe's reign were his war with the papacy and the extermination of the knights templars; the former had its origin in the attempts of the king to tax the clergy as well as the laity for the heavy expenses of his numerous wars. Boniface forbade the clergy to submit to taxation, while Philippe, on his side, ordered that neither money nor valuables were to be exported, thus cutting off a main supply of papal revenue; and on the pope's legate insolently reprimanding him, he threw him into prison. Philippe now called an assembly of states, in which deputies of towns appeared—though not for the first time—and obtained assurance of their support, even in case of excommunication and interdict. Boniface, in turn, assembled a council at Rome (1302), which supported his view, and the celebrated bull, *Unam Sanctam*, was issued. Philippe caused the bull to be publicly burned, and with the consent of the states-general confiscated the property of those prelates who had sided with the pope. Boniface now excom-

municated him, but the king, nothing daunted, sent to Rome his general, William de Nogaret, who seized and imprisoned the pope; and though he was released after a few days by a popular rising, he soon afterwards died. In 1304 Philippe obtained the elevation of one of his own creatures to the papal chair as Clement V., on condition of his residing at Avignon, and giving up the knights templars (q.v.). In accordance with this agreement, the templars were seized (1306–14), and burned by hundreds, and their wealth appropriated by Philippe. The grandmaster, Jacques Molay, was burned Mar. 18, 1314, and when dying he summoned Philippe to compear within a year and a day, and the pope within 40 days, before the judgment-seat of God; strange to say, both the pope and king died within the time mentioned, the latter at Fontainebleau, Nov. 29, 1314. Philippe during his whole reign steadily strove for the suppression of feudalism and the introduction of the Roman law; but while thus increasing the power of the crown, and also that of the third estate, he converted royalty, which was formerly protecting, kind, and popular to the mass of the people, into a hard, avaricious, and pitiless task-master. Under him the taxes were greatly increased, the Jews persecuted, and their property confiscated; and when these means were insufficient to satisfy Philippe's avarice, he caused the coinage to be greatly debased; yet he was an able monarch, and under him France was extended almost to its present limits on the n. and east.

PHILIPPE VI., OF VALOIS, King of France, was the son of Charles of Valois, younger brother of Philippe IV., and succeeded to the regency of France on the death of Charles IV., the proclamation of a king being deferred on account of the pregnancy of Charles IV.'s widow; but on her giving birth to a daughter, Philippe caused himself to be crowned king at Reims, May 29, 1328, and assumed royal authority. His right to the throne was denied by Edward III. of England, the grandson of Philippe IV., who declared that females, though excluded by the Salic law, could transmit their rights to their children, and therefore insisted upon the superiority of his own claims. Philippe, however, was not only already crowned king, but he had the support of the people. His reign commenced gloriously, for marching into Flanders to support the count against his rebellious subjects, he wiped out the disgrace of Courtrai by vanquishing the Flemings at Cassel, Aug. 23, 1328. He was obliged to give up Navarre (q.v.), as the Salic law of succession did not apply to it, but he retained Champagne and Brie, paying for them a considerable annual stipend. Philippe seems to have had no settled plan of government, and no systematic political action; his acts were regulated by the whim of the hour, and were mostly calculated to gratify his own vanity and love of show. From 1330 to 1336 constant encroachments had been made upon the English possessions in France, till at last Edward III.'s patience was exhausted; and, on Aug. 21, 1337, he formally declared war, and a commencement of this terrible hundred years' contest was made both in Guienne and Flanders; it was carried on languidly for several years, the only prominent incident being the destruction of the French fleet off Sluys, June 24, 1340. In Mar., 1343, Philippe established the "gabelle," or monopoly of salt, a heavy percentage tax on all mercantile transactions. The constant round of fêtes and tournaments at court was never interrupted, even when the war had well nigh exhausted the wealth of the country, for the money to carry them on was immediately provided by some new tax or fresh confiscation. In 1346 Edward III. landed in Normandy, ravaged the whole country to the environs of Paris, and totally defeated Philippe at Crécy (q.v.). A truce was then concluded, but the devoted kingdom had no sooner been released from war, than destruction in another and more terrible form, that of the "black death" (q.v.), threatened it. The wild extravagance of the court was nothing lessened by this visitation; but the financial embarrassments in which Philippe found himself compelled him to agree to the passing of a law (1338) which gave to the assembly of the states the sole power of imposing taxes. He received Dauphiné in gift in 1340, purchased Majorca from its unfortunate king, and died Aug. 22, 1350, neither loved nor respected. He was a despiser of learning and a bigot.

PHILIPPE LE BON, i.e., "the Good," Duke of Burgundy, the son of Jean "Sans-Peur" by Margaret of Bavaria, and grandson of Philippe the Bold, was born at Dijon, the capital of the duchy, June 13, 1396, and on the assassination of his father on the bridge of Montereau at the instigation of the dauphin, afterwards Charles VII., succeeded to the duchy of Burgundy. Bent on avenging the murder of his father, he entered into an offensive and defensive alliance with Henry V. of England at Arras in 1419, at the same time recognizing him as the rightful regent of France, and heir to the throne after Charles VI.'s death. This agreement, which disregarded the Salic law, was sanctioned by the king, parliament, university, and states-general of France by the treaty of Troyes, but the dauphin declined to resign his rights, and took to arms; he was, however, defeated at Crevant (1423) and Verneuil (1424), and driven beyond the Loire. Some disputes with the English prompted Philippe to conclude a treaty with the king of France in 1429. However, the English, by ceding to Philippe the province of Champagne, and paying him a large sum of money, restored him to their side. At this time, by becoming heir to Brabant, Holland, Zealand, and the rest of the Low Countries, he was at the head of the most flourishing and powerful realm in western Europe; but, though much more powerful than his superior, the king of France, he preferred to continue in nominal subjection. Smarting under some fresh insults of the English viceroy, and being strongly

urged by the pope, he made a final peace (1435) with Charles, who gladly accepted it, even on the hard conditions which Philippe prescribed, The English, in revenge, committed great havoc among the merchant navies of Flanders, which irritated Philippe to such an extent that he declared war against them, and, in conjunction with the king of France, gradually expelled them from their French possessions. The imposition of taxes, which were necessarily heavy, excited a rebellion, headed, as usual, by the citizens of Ghent, but the duke inflicted upon them a terrible defeat, July, 1454, though he wept over a victory bought with the blood of 20,000 of his subjects. The latter part of his reign was filled with trouble caused by the quarrels between Charles VII. and his son, the dauphin Louis, afterwards Louis XI., who had fled from his father's court, and sought shelter from Philippe, although, after ascending the throne, far from showing gratitude, he tried, in the most dishonorable manner, to injure his benefactor. Philippe died at Bruges, July 15, 1467, deeply lamented by his subjects. Under him Burgundy was the most wealthy, prosperous, and tranquil state in Europe; its ruler was the most feared and admired sovereign of his time, and his court far surpassed in brilliancy those of his contemporaries. Knights and nobles from all parts of Europe flocked to his jousts and tournaments.

PHILIPPE LE HARDI (*Philippe the Bold*), the founder of the second and last ducal house of Burgundy, was the third son of Jean, king of France, and his wife, Bonne of Luxemburg, and was born Jan. 15, 1342. He was present at the battle of Poitiers, 1356, and displayed such heroic courage, venturing his own life to save that of his father, as gained for him the sobriquet of *le hardi*, or "the Bold." He shared his father's captivity in England, and, on returning to France in 1360, received in reward of his bravery the duchy of Touraine, and subsequently (1363) also that of Burgundy, being created at the same time the first peer of France. On the accession of his brother, Charles V., to the throne of France, Philippe had to resign Touraine, but, as a compensation, obtained in marriage Margaret, the heiress of Flanders. In 1372 he commanded the French army opposed to the English, and took from them many of their possessions. In 1380 he exerted himself to suppress the sedition of the Flemish towns against their count, and succeeded with some of the malcontents; but the citizens of some of the populous places, especially Ghent, were possessed with such a fever of independence, that after many fruitless attempts to induce them to return to their allegiance, Philippe raised an army, and inflicted upon them the bloody defeat of Rosbeck, Nov. 27, 1382, leaving 26,000 of them on the field. Flanders, the county of Burgundy, Artois, Rethel, and Nevers fell to him by the death of the count in 1384, and the influence of his power, combined with prudence and good management on his part, soon won the affection and esteem of his new subjects. Energy and wisdom characterized his government; arts, manufactures, and commerce were much and judiciously encouraged, and his territory (a kingdom in extent) was one of the best governed in Europe. During the minority and subsequent imbecility of his nephew, Charles VI. of France, he was obliged to take the helm of affairs, and preserve the state from insurrection and sedition within, and the attacks of the English without. He was on his way to repel an attack of the latter on Flanders when he died at the chateau of Hal in Brabant, a little to the s.w. of Brussels, Apr. 27, 1404.

PHILIPPEVILLE, the ancient Russicada, seaport of Algeria, in the province of Constantine, and 38 m. n.n.e. of the city of that name, on the gulf of Stora, between cape Boujaroun and cape de Fer. It was laid out in 1838 by marshal Valée, on the ruins of the ancient Russicada, and is one of the prettiest towns in Algeria, and thoroughly French in its character. It is an important entrepôt of the commerce of the e. of Algeria and Sahara, and the country in the vicinity is picturesque and fertile, producing grain, tobacco, cotton and fruits. It contains numerous public offices, a large hospital and dispensary, Catholic and Protestant churches, public library and museum, theater, etc. In the vicinity at Filfila are quarries of marble and iron mines. The port, protected by two breakwaters, has an area of 125 acres and is divided into an outer and an inner harbor. There are here a grain distillery, tanneries, and cork manufactures. Philippeville is the chief station of the railway for the province of Constantine, and is connected by steamer with Marseilles and Algiers. Pop. '91, 21,962.

PHILIP'PI, a city of Macedonia. It was named after Philip II. of Macedon, who conquered it from Thrace, up to which time it had been called Crenides, or the "place of fountains," and enlarged it because of the gold mines in its neighborhood. Philip worked the mines so well that he got from them 1000 talents a year. It is famous on account of the two battles fought in 42 B.C. between Antony and Octavianus on the one side, and the republicans under Brutus and Cassius on the other. The first engagement was undecided; in the second, twenty days after, the republic finally perished. The apostle Paul founded a Christian church here in 53 A.D., to which one of his epistles is addressed. The ruins of the city still bear the name of Philippi, or Felíba.

PHILIP'PIANS, EPISTLE TO THE, one of the latest of the Pauline epistles. It was transmitted from Rome probably about the year 63 A.D., through Epaphroditus, apparently a pastor of the Philippian church, who had been sent to minister to the necessities of the apostle. The Philippian church was looked upon with peculiar tenderness and affection by Paul. It was the first fruits of his evangelization in Europe; its members were singularly kind towards him; again and again, when he was laboring in other

cities, such as Thessalonica and Corinth, they sent him contributions that he might not be burdensome to his new converts, and now they had sent one of the brethren all the way to Rome with presents for him, knowing that he was in bonds, and suspecting—what was in fact the case—that he might be in sore straits for his daily bread. His letter to them is deeply affecting. It contains not so much of doctrinal matter as of a warm outpouring of his personal feelings towards his friends at Philippi. The historical evidence in favor of the authenticity of the epistle is so strong that it could hardly give way to any internal criticism; and the objections of this kind, urged by Bauer, Schwegler, and others of the Tübingen school, who regard it as a Gnostic composition of the 2d c., are regarded as preposterous, even by many Biblical scholars who do not profess to be orthodox.

The epistle to the Philippians was referred to by Polycarp (107 A.D.), in his letter to the church at Philippi, as the well-known work of Paul the apostle; acknowl- his letter to the church at Philippi, as the well-known work of Paul the apostle; acknowledged by the heretical Marcion, 140, in common with orthodox Christians; quoted by Irenæus, Clement of Alexandria, Tertullian, and in the epistle of the churches of Lyons and Vienna, 177; contained in the Peshito (Syriac) version; and included in the canonical lists of the Muratorian Fragment, Eusebius, the council of Laodicea, and the synod of Hippo. It is only in recent times that its genuineness, notwithstanding this abundant and unanimous testimony, has been assailed by criticism and vague conjecture. The general consent of early tradition, and the internal evidence of the epistle itself, show that it was written at Rome, near the end of Paul's first imprisonment there; so that as a strain of triumph in his bonds at Rome, it is like his hymn of praise in the stocks at Philippi. The epistle may be divided into three parts. The first part contains the salutation, expressing the apostle's ardent and grateful attachment to the Philippian Christians; his assurance that his sufferings at Rome had resulted in great advantage to the gospel, and joy to himself, seeing that whether he lived to preach Christ, or died while prosecuting the work, Christ would be honored and his own salvation secured; also, his affectionate exhortations to the Philippians to honor their profession by a holy life; to be united, zealous, courageous, consecrated, conformed to Christ's humility, diligent in working out their own salvation through the help of God, and consistent in their conduct as the children of God, and the lights of the world, with his commendation of Timothy, whom he hoped to send soon to them, and of Epaphroditus whom he was about to send. The second part contains an earnest warning against Judaizing teachers, whom the apostle condemned because of their evil character, bad influence, and vain reliance on Jewish privileges which had become worthless, and which he, although as a native Jew he had possessed them all, utterly renounced; as, indeed, he renounced for Christ all things that could be accounted gain. Pressing on to attain these for himself, he exhorted the Philippians against worldliness and sensuality; adducing as the highest motive that their citizenship was in heaven from which Christ would come again. The third part contains special entreaties to individuals at Philippi; general exhortations to perpetual joy in the Lord, grateful and confiding prayer—with the promise of peace from God which would be like a strong fortress for their souls—and the enthusiastic pursuit of all good things; with grateful acknowledgment of the kindness which the Philippians had shown him, from his first preaching the gospel among them to their last overflowing bounty sent by their special messenger.

PHILIP'PICS, originally the three orations of Demosthenes against Philip of Macedon. The name was afterwards applied to Cicero's orations against the ambitious and dangerous designs of Mark Antony. It is now commonly employed to designate any severe and violent invective, whether oral or written.

PHILIP'PINE ISLANDS lie to the n. of Borneo and Celebes, between 5° and 26° n. lat., and 117° 16′ to 126° 53′ e. long. They are more than 1200 in number, with an area of 114,326 sq. miles. Pop. 7,000,000, three-fourths of whom are subject to Spain, the remainder governed, according to their own laws and customs, by independent native princes.

Luzon, in the n. has an area of 40,024 sq. m., and next is Mindanao, or Magindanao, in the s. The islands lying between Luzon and Mindanao are called the Visayas, the largest of which are—Samar, Mindoro, Panay, Leyte, Negros, Masbate, and Zebu. There are upwards of a thousand lesser islands, of which little is known. To the s.w. of the Visayas lies the long, narrow island of Palawan, formed of a mountain-chain with low coast-lines, cut with numerous streams, and exceedingly fertile. The forests abound in ebony, log-wood, gum-trees, and bamboos. To the n. of Luzon lie the Batanen, Bashee, and Babuyan islands, the two first groups being inhabited, the last unpeopled.

The Sooloo islands form a long chain from Mindanao to Borneo, having the same mountainous and volcanic structure as the Philippine islands, and all are probably fragments of a submerged continent. Many active volcanoes are scattered through the islands, Mayon, in Luzon, and Buhayan, in Mindanao, often causing great devastation. The mountain-chains run n. and s., and never attain a greater elevation than 7,000 feet. The islands have many rivers, the coasts are indented with deep bays, and there are many lakes in the interior. Earthquakes are frequent and destructive, Manila, the capital, having been nearly destroyed by one in 1863. On Feb. 3, 1864, another terrific earthquake visited the province of Zamboango, in Mindanao, leveling all the houses to the ground, and causing some of the smaller islands to disappear. Earthquakes

occurred also in 1880 and 1881. The soil is extremely fertile, except where extensive marshes occur. In Mindanao are numerous lakes, which expand during the rainy seasons into inland seas. Rain may be expected from May to December, and from June to November the land is flooded. Violent hurricanes are experienced in the n. of Luzon and w. coast of Mindanao. Especially during the changes of the monsoons, storms of wind, rain, thunder and lightning prevail. The weather is very fine, and heat moderate, from December to May, when the temperature rapidly rises and becomes oppressive, except for a short time after a fall of rain. The fertility of the soil and the humid atmosphere produce a richness of vegetation which is nowhere surpassed. Blossoms and fruit hang together on the trees, and the cultivated fields yield a constant succession of crops.

Immense forests spread over the Philippine islands, clothing the mountains to their summits; ebony, iron-wood, cedar, sapan-wood, gum-trees, etc., being laced together and garlanded by the bush-rope or palasan, which attains a length of several hundred feet. The variety of fruit-trees is great, including the orange, citron, bread fruit, mango, cocoa-nut, guava, tamarind, rose-apple, etc.; other important products of the vegetable kingdom being the banana, plantain, pine-apple, sugar-cane, cotton, tobacco, indigo, coffee, cocoa, cinnamon, vanilla, cassia, the areca-nut, ginger, pepper, etc., with rice, wheat, maize, and various other cereals.

Gold is found in river-beds and detrital deposits, being used, in form of dust, as the medium of exchange in Mindanao. Iron is plentiful, and fine coal-beds, from one to four feet thick, have been found. Copper has long been worked in Luzon. There are also limestone, a fine variegated marble, sulphur in unlimited quanity, quicksilver, vermilion, and saltpeter—the sulphur being found both native and in combination with copper, arsenic, and iron.

Except the wild cat, beasts of prey are unknown. There are oxen, buffaloes, sheep, goats, swine, harts, squirrels, and a great variety of monkeys. The jungles swarm with lizards, snakes, and other reptilia; the rivers and lakes with crocodiles. Huge spiders, tarantulas, white ants, mosquitoes, and locusts are plagues which form a set-off to the beautiful fire-flies, the brilliant queen-beetle (*elater noctilucus*), the melody of myriads of birds, the turtle-doves, pheasants, birds of paradise, and many species of paroquets.

The caverns along the shores are frequented by the swallow, whose edible nest is esteemed by the Chinese a rich delicacy. Some of them are also tenanted by multitudes of bats of immense size. Buffaloes are used for tillage and draught; a small horse for riding. Fowls are plentiful, and incredible numbers of ducks are artificially hatched. Fish is in great abundance and variety. Mother-of-pearl, coral, amber, and tortoise-shell are important articles of commerce.

The Tagals and Visayers are the most numerous native races. They dwell in the cities and cultivated lowlands; being largely converts to Roman Catholicism, and a considerable number, especially of the Visayers, Mohammedan. The mountain districts are inhabited by a negro race, who, in features, stature, and savage mode of living closely resemble the Alfoers of the interior of Papua, and are probably the aborigines driven back before the inroads of the Malays. A few of the negroes are Christian, but they are chiefly idolaters, or without any manifest form of religion, and roaming about in families, without fixed dwelling. The mestizos form an influential part of the population; by their activity engrossing the greatest share of the trade. These are mostly of Chinese fathers and native mothers. Few Spaniards reside in the Philippine islands, and the leading mercantile houses are English and American, between whom and the natives the Chinese are the chief middlemen. The principal languages are the Tagalese and Visayan. Rice, sweet potatoes, fish, flesh, and fruits form the food of the Tagals and Visayers, who usually drink only water, though sometimes indulging in coca-wine. Tobacco is used by all. They are gentle, hospitable, fond of dancing and cock-fighting.

The government is carried on by a governor-general and a captain-general, and the 43 provinces are administered by alcaldes, or commandants. Education is far behind, and similar to what it was in Europe during the middle ages. There is an archbishop of Manila, and bishops of New Segovia, Nueva Caceres, and Zebu. Religious processions are the pride of the people, and are formed with great parade, thousands of persons carrying wax-candles, etc. The natives not only build canoes, but ships of considerable tonnage. They weave various textile fabrics of silk, cotton, abaca, and very fine shawls and handkerchiefs from the fiber of pineapple leaves.

The revenue of the Philippine islands in 1894–95 was estimated at £2,715,980, and the expenditure £2,656,026. There is an export duty on tobacco and almost all imports are heavily taxed—as high as 100 % *ad valorem* on petroleum and cotton cloth.

It is to be remembered that all the ports of this archipelago, except Sual, Iloilo Zebu, and Manila, are still closed against foreign vessels. In 1868 there seemed a gleam of hope that a more liberal commercial policy would be adopted by Spain for their possessions among the Philippine islands. In that year it was decreed that differential duties should be abolished in April, 1871. They were abolished accordingly, but only for three months. In July, an order was issued granting importers, under the Spanish flag, of foreign goods, an advantage of 2.5 per cent. The value of the produce exported, 1895, to Great Britain was £1,606,271. The chief exports are hemp and sugar. The imports from Great Britain, '95, were valued at £4,151,803, on which large duties were placed. Other exports are copra, tobacco, cigars, indigo, Manila hemp of Abaca (q. v.), coffee, dye-woods, hides, gold-dust, and beeswax. Cotton, woolen, and silk goods, agricultural implements, watches, jewelry, etc., are imported. In 1895, 304 vessels of

425,025 tons were cleared from Manila, Zebu, and Iloilo. British merchants do the largest business.

The Philippine islands were discovered in 1521 by Magellan, who, after visiting Mindanao, sailed to Zebu, where, taking part with the king in a war, he was wounded, and died at Mactan, April 26, 1521. Some years later the Spanish court sent an expedition under Villabos, who named the islands in honor of the prince of Asturias, afterwards Philip II. For some time the chief Spanish settlement was on Zebu; but in 1581 Manila was built, and has since continued to be the seat of government.

On August 1st, 1896, a formidable conspiracy of the Malays and mestizos came to light, news of it having been obtained, it is said, through the confession of the wife of one of the principal conspirators. It had for its object the complete independence of the islands from Spain, and is said to have received support from the Chinese, Japanese, and some of the foreign merchants residing on the islands. The alleged grievances of the natives were the heavy taxation, the enforced duty of giving, each year, forty days' labor to the government, the income tax, and the extortions of corrupt officials. Other accounts represent the trouble as having arisen from the oppression of the priests. The government at once took measures to suppress the conspiracy. Hundreds were arrested on suspicion, including persons connected with Philippine affairs in Madrid. It had been planned to make a sudden attack upon the citadel at Manila, to murder the governor, Marshal Blanco, and massacre the garrison of the Spanish posts, and the officials and priests. The government's prompt action in arresting the conspirators and its attempt to terrorize the insurgents by the execution of numerous captives failed to prevent the revolt. It broke out on August 20, 1896, in Manila and several other towns, but at first was unsuccessful. The rebels were repulsed from Manila on August 30th, and a considerable body of them was driven into the mountains. They gathered recruits rapidly, however, and captured the naval station of Cavite, eight miles from Manila. The war was marked by the most atrocious cruelties on the part of both the natives and the Spaniards. Tortures of every kind were inflicted and scores of prisoners in the hands of the Spaniards were suffocated by being confined in the unventilated dungeon of San Sebastian. On October 17th, the rebels were defeated with considerable loss at the town of Nasugdu, but early in the following month the Spanish troops were repulsed in an attack on Novaleta. This was offset soon afterwards by the Spanish victory at Santa Cruz de Laguna, where 4,000 rebels were defeated with considerable loss. Marshal Blanco's success, however, was but slight and he was soon afterwards recalled by the Spanish government, which sent out Gen. Polivieja to take his place. It was the latter's plan to surround the main force of the insurgents in Cavite, and his campaign was vigorously begun. A native force was attacked and driven back on the border of Bulacan and another victory was gained by the Spaniards at Santa Maria at the close of 1896. These defeats had the effect of discouraging the natives, who now surrendered in large numbers in accordance with the offer of amnesty made by Gen. Polivieja, to all those who would lay down their arms within a specified time. In the spring of 1897 the Spaniards gained further advantages but did not succeed in suppressing the revolt. In May it was estimated that there were 25,000 of the rebels under arms, and, in June, 1897, the revolt was still by no means subdued.

See Foreman, *The Philippine Islands* (1896); the diplomatic and Consular Reports from Spain and her colonies for 1896; and *Deutsches Handels Archiv* (1896).

PHIL'IPPINS, a Russian sect, so called from the founder, Philip Pustoswiät, under whose leadership they emigrated from Russia in the end of the 17th c., are a branch of the Raskolniks (q.v.). They call themselves Starowerski, or "Old Faith Men," because they cling with the utmost tenacity to the old service-books, the old version of the Bible, and the old hymn and prayer-books of the Russo-Greek church, in the exact form in which these books stood before the revision which they underwent at the hands of the patriarch Nikon, in the middle of the 17th century. There are two classes of the Raskolniks—one which recognizes popes (or priests); the other, which admits no priest or other clerical functionary. The Philippins are of the latter class; and they not only themselves refuse all priestly ministrations, but they regard all such ministrations—baptism, marriage, sacraments—as invalid; and they re-baptize all who join their sect from other Russian communities. All their ministerial offices are discharged by the Starik, or parish elder, who for the time takes the title of pope, and is required to observe celibacy. Among the Philippins the spirit of fanaticism at times has run to the wildest excesses. They refuse oaths, and decline to enter military service; and having, on account of this, and many other incompatibilities of the system with the Russian practice, encountered much persecution, they resolved to emigrate. Accordingly, in 1700, under the leadership of Philip Pustoswiät, they settled partly in Polish Lithuania, partly afterwards in east Prussia, where they still have several small settlements with churches of their own rite. They are reported to be a peaceable and orderly race. Their principal pursuit is agriculture; and their thrifty and industrious habits have secured for them the good-will of the proprietors.

PHILIPPOP'OLIS, capital of Roumelia, Turkey, 112 m. w.n.w. from Adrianople. It stands on a small island formed by the Maritza, which here becomes navigable. This island rises as a hill in the midst of a vast plain, which extends beyond Adrianople on the e., and from the base of the Rhodope mountains on the s., to the Balkan chain on the north. The plain is extremely fertile, and cereals, tobacco, wine, etc. are produced.

Philippopolis carries on a very extensive commerce both with Austria and with the East. Philippopolis is an ancient town, and in the time of the Romans bore the name of *Trimontium*. Philippopolis is the seat of a Greek archbishop. The North American board of missions has a station at Philippopolis. Pop. 1888, 33,600 of whom 19,500 are Bulgarians, 5,600 Mohammedans, and 3,900 Greeks.

PHILIPPOTEAUX, Félix Emanuel Henri, b. Paris, 1815; student with the painter, Cogniet, whose battle pieces became the models for the pupil's prolific after work. One of his first notable paintings was the "Rock of Ice," which appeared in 1833, and represented a scene in the American war of the revolution. One of his others is the bombardment of Paris by the Germans in 1871, painted in 1872. His works are mostly on a grand scale, with many figures, and enliven the walls of palaces and public galleries in France. His panorama, "The Siege of Paris," was exhibited in N. Y. city. He d. 1884.

PHILIPPSBURG, an urban commune of Baden, 17 m. n. from Karlsruhe, on the right bank of the Rhine, at the mouth of the Salzbach. In former times it was one of the most important fortresses on the Rhine, and belonged to the bishop of Spires. During the Thirty Years' war, Philippsburg fell successively into the hands of the Swedes, the French, the Imperialists, and again of the French, who were confirmed in possession of it by the peace of Westphalia. In the war between Louis XIV. and Germany, it was taken by the Germans under duke Charles of Lorraine, and assigned to Germany by the peace of Nimeguen in 1679, but was again taken in 1688 by the French under Vauban, and once more restored to Germany by the peace of Ryswick in 1697. The French captured it again in 1734, and this time with little difficulty, the strength of the fortress being now much diminished, although the capture cost the life of the duke of Berwick, their commander; and they again relinquished it in 1735. During the wars of the French revolution, Philippsburg was bombarded in 1799, taken, and its fortifications completely destroyed in 1800. Pop. '95, 2469.

PHILIPS, Ambrose, was b. in Leicestershire about 1671. He studied at St. John's college, Cambridge, and took his degree of M.A. in 1700. In 1709 his pastorals appeared, along with those of Pope, in *Tonson's Miscellany;* and the same year, having gone on a diplomatic mission to Copenhagen, he addressed from thence a "poetical letter" to the earl of Dorset, which was published, with a warm eulogium from Steele, in the *Tatler*. In 1712, he brought on the stage *The Distressed Mother*, a tragedy adapted from Racine's *Andromaque*, which had great success. He subsequently wrote two other tragedies, but they proved failures. Some translations from Sappho, which appeared in the *Spectator*, added greatly to Philips's reputation, but Addison is believed to have assisted in these classic fragments. Some exaggerated praise of Philips having appeared in the *Guardian*, Pope ridiculed his pastorals in a piece of exquisite irony, which led to a bitter feud between the poets. Philips even threatened personal chastisement, and hung up a rod in Button's coffee-house, but no encounter took place. One of the names fastened upon Philips was that of "Namby Pamby," arising from a peculiar style of verse adopted by him in complimentary effusions consisting of short lines and a sort of infantine simplicity of diction, yet not destitute of grace or melody. The accession of the house of Hanover proved favorable to the poet; he was appointed pay-master, and afterwards a commissioner of the lottery; and going to Ireland as secretary to archbishop Boulter, he became secretary to the lord chancellor, M.P. for Armagh, and registrar of the prerogative court. He died in 1749. Philips is somewhat conspicuous in literary history from the friendship of Addison and the enmity of Pope; but his poetry, wanting energy and passion, has fallen out of view.

PHILIPS, or **PHILLIPS**, John, 1676–1708; b. Bampton, England; educated at Winchester school and at Christ-church, Oxford. He published in 1703 *The Splendid Shilling*, written while in college; 1705, *Blenheim*, in honor of Marlborough's victory; 1706, *Cyder*, in two books, in the manner of the *Georgics*, of Virgil.

PHILIPSTOWN, a market and post town (formerly the assize town) of King's co., province of Leinster, Ireland, 47 m. s.w. from Dublin. Its charter dates from 1567; and in the reign of James II. it obtained the privilege of sending two members to parliament. This privilege was withdrawn at the Union. It is at present, and has long been, a place of hardly any trade and entirely without manufacture. It contains an old castle where once resided King Philip of Spain, whence the name of the town. It is now used for barracks. Pop. less than 1000.

PHILISTINES (*LXX.*, *allophuloi*, strangers), a word either derived from a root *phalasa* (Æth.), to emigrate, wander about, or identified with Pelasgians (q.v.), or compared by others with *shefela* (Heb.), lowlanders; designates a certain population mentioned in the Bible as being in frequent contact with the Jews, and who lived on the coast of the Mediterranean, to the s.w. of Judæa, from Ekron toward the Egyptian frontier, bordering principally on the tribes of Dan, Simeon, and Judah. Our information about the origin of the Philistines is extremely obscure and contradictory. The genealogical table in Genesis x. 14 counts them among the Egyptian colonies (the "Calushim, out of whom came Philistim"); according to Amos ix. 7, Jeremiah xlvii. 4, and Deuteronomy ii. 23, they came from Caphtor. But supposing that the Casluhim were some separate tribe, and yet Caphtorian colonists, the question still remains, whether

Caphtor can be identified with Cappadocia in Asia Minor, as the early versions (*LXX.*, *Targ.*, *Pesh.*, *Vulg.*) have it; or whether it be Pelusium, Cyprus, or the isle of Crete. The latter opinion seems not the least probable among them. At what time they first immigrated, and drove out the Canaanitish inhabitants, the Avvim, is difficult to conjecture. They would appear to have been in the country as early as the time of Abraham; and in the history of Isaac, Abimelech, king of Gerar, is distinctly called king of the Philistines. Yet, even supposing that in Genesis the country is designated by the name which it bore at a later period, there can yet be no doubt of the people being firmly established at the time of Moses (Exodus xv., 14, etc.). Thus the date of their immigration would have to be placed at about 1800 B.C. At the Exodus Moses, evidently fearing an encounter with the warlike colony for his undisciplined band, did not choose the shorter way to Canaan through their territory, but preferred the well-known circuitous route. At a later period, however, Joshua, having triumphed over 31 Canaanite princes, also conceived the plan of making himself master of the possessions of the Philistines; but his intended disposal of their country for the benefit of the tribe of Judah was never carried out. At this time, they were subject to five princes (Seranim = axles, pivots), who ruled over the provinces of Gaza, Ashdod, Askalon, Gath, and Ekron. Not before the period of the Judges did they come into open collision with the Israelites; and the strength and importance in which they suddenly appear then, contrast so strangely with their insignificance at the time of the patriarchs, that many theories—a double immigration principally—have been propounded to explain the circumstance. We find them daring powerful nations like the Sidonians, whom, about 1209 B.C., they forced to transfer their capital to a more secure position on the island of Tyre; or the Egyptians, with whom they engaged in naval warfare at the same time, under Ramesas III. With the Israelites their war assumed the air of guerrilla raids, sometimes into the very heart of the country. Under Shamgar (about 1370 B.C.), they were repulsed, with a loss of 600 men; however, about 200 years later, the Israelites were tributary to them, and continued to groan under their yoke, with occasional pauses only, until Samson first commenced humiliating them. But they were still so powerful at the time of Eli, that they carried away the ark itself. Under Samuel, their rule was terminated by the battle of Mizpah. Saul was constantly engaged in warding off their new encroachments, and at Gilboa, he and his sons fell in a disastrous battle against them. At this time, they seem to have returned to their primitive form of a monarchy, limited, however, by a powerful aristocracy, the king's formal title again being "Abimelech" = "father-king," as we find it in Genesis. David succeeded in routing them repeatedly; and under Solomon their whole country seems to have been incorporated in the Jewish empire. The internal troubles of Judæa emboldened the Philistines once more to open resistance. Under Joram, in union with the Arabians, they invaded Judæa, and not only carried away the royal property, but also the serail and the royal children. Uzziah, however, recovered the lost ground; he overthrew them, and dismantled some of their most powerful fortresses—Gath, Yabne, and Ashdod, and erected forts in different parts of their country. Under Ahaz, they rose again, and attacked the border-cities of the "plain" on the s. of Judah; and a few years later, renewed their attacks, in league with the Syrians and Assyrians. Hezekiah, in the first years of his reign, subjected their whole country again, by the aid of the Egyptians, whom we find in the possession of five cities. The Assyrians, however, took Ashdod, under Tartan, which was retaken again by Psammetich, after 29 years' siege. About this time, Philistæa was traversed by a Scythian horde on their way to Egypt, who pillaged the temple of Venus at Askalon. In the terrible struggles for supremacy which raged between the Chaldæans and Egyptians, Philistea was the constant battle-ground of both—her fortresses being taken and retaken by each of them in turn; so that the country soon sank into ruin and insignificance. Yet a shadow of independence seems to have been left it, to judge from the threats which Zechariah (ix. 5), after the exile, utters against Gaza and Askalon, and their pride. In the time of the Maccabees, the Philistines were Syrian subjects, and had to suffer occasionally from the Jews, although intermarriages between the two nations were of no rare occurrence. Alexander Balas transferred part of the country to Judæa; another part was taken by Alexander Jannæus; Pompey incorporated some of the cities with Roman Syria; Augustus transferred another portion to Herod; and finally, Salome, his sister, received a small principality of it, consisting of Jamnia, Ashdod, and Askalon. But by this time the name of the country had long been lost in that of Palestine, which designated all the territory between Lebanon and Egypt.

Of their state of culture, institutions, etc., we know very little indeed. They appear as a civilized, agricultural, commercial, and warlike nation. They traded largely, and their wares seem to have been much sought after. Their worship was much akin to that of the Phenicians—a nature-religion, of which Dagon, Ashtaroth, Beelzebub, and Derceto were the chief deities. Priests and soothsayers abounded; their oracles were consulted even by people from afar. They carried their charms about their persons, and their deities had to accompany them to the wars. They do not seem to have practiced circumcision. As to their language, so little is known about it, that conjectures seem more than usually vain. Those who take them to have been Semites, conclude that their language, too, was Semitic; others, who would identify them with the Pelasgians, differ also respecting their language. Thus much is certain, that their proper

names, as they are recorded in the Bible, are mostly Semitic, and that there always remained a difference of dialect between the Hebrew and the Philistean idiom.

PHILISTINISM is a cant term introduced into England by Carlyle, whose use has since been widely extended by Matthew Arnold. The allusion is to the ancient Philistines, the enemies of the children of light; hence Philistinism, in its modern application, means stolid opposition to the higher intelligence of the age, inaccessibility to ideas; plain, humdrum, respectable conventionalism. The German students first applied the term *Philister* to a townsman or to one who had not been trained in a univ.; it soon found a foothold in German literature, and was first imported into England in Carlyle's essay on Goethe. The term has now grown so hackneyed that the finer sort of people hesitate to use it, and its indiscriminate use has almost emptied it of meaning. Perhaps Leslie Stephen's definition of Philistinism, as "a term of contempt applied by prigs to the rest of their species," is the only one that is sufficiently comprehensive.

PHILLIMORE, Sir Robert Joseph; b. London, 1810; educated at Westminster and Oxford. In 1831 he became a clerk of the board of control, and soon afterward was called to the bar, where he acquired a large practice, and was made a queen's counsel. In 1840 he was appointed official to the archdeaconries of Middlesex and London, and in 1844 chancellor of the duchy of Chichester. He was a member of parliament in the liberal-conservative interest, and made some notable speeches on church rates, and tithe commutations, and brought in the bill called "Dr. Phillimore's act," authorizing ecclesiastical courts to take *viva voce* testimony. He was made judge of the Cinque Ports in 1855, advocate general in admiralty, 1862, when he was knighted, and in 1867, judge of the high court of admiralty and of the arches court of Canterbury. He was judge advocate general, 1871–73, and made master of the faculties in the latter year. In 1875 he resigned his other offices, and was appointed judge of the admiralty and probate division of the high court of justice. As judge of the arches court, the chief ecclesiastical court, he rendered many important judgments, some of which have been republished. The most valuable of his numerous legal works is his *Commentaries upon International Law*, 4 vols., 1854–61. Among his other writings are *Memoirs and Correspondence of Lord Lyttleton*, 1845; *Clergy Discipline*, 1872; *The Ecclesiastical Law of the Church of England*, 1873; and a translation of Lessing's *Laocoön*. He d. in 1885.

PHILLIP, John, R.A., was b. May 22, 1817, at Aberdeen. At a very early age he gave indication of the talent which afterwards so distinguished him: and before he had attained his 15th year had painted various pictures showing his feeling for color. He thus procured an introduction to lord Panmure, by whom he was enabled to go to London to pursue his studies. He began by copying from the Elgin marbles at the British museum, and after a few months was admitted as a student at the royal academy.

All his early subjects were of Scotch character, such as a "Scotch Fair," "Baptism in Scotland," a "Scotch Washing," "The Offering," etc. In the year 1851 he went to Spain in search of health, which he found, and with it a change in the character of his subjects. On his return home he established himself at the head of the painters of the habits and customs of the Spanish people. In 1853 he exhibited at the royal academy "Life among the Gipsies at Seville." His pictures for 1854–55, "A Letter Writer of Seville," and "El Paseo," were both purchased by her majesty the queen. In 1857 he attained the rank of associate of the royal academy, and the following year exhibited a most powerful picture of "Spanish Contrabandistas," which was purchased by the late prince consort, of whom he also painted a portrait the same year for the town-hall of his native city. In 1859 he received the full honor of royal academician. His work for exhibition in 1860 was certainly the most difficult he had yet tried, and his success was proportionably great. "The Marriage of the Princess Royal" was pronounced by both his fellow-artists and the public as a decided success. His next portrait subject (exhibited 1863) was, if possible, a still more difficult task, being the "House of Commons, 1860," containing upwards of 30 portraits of the leading members of both sides of the house; in it he was equally successful. He died Feb. 27, 1867.

PHILLIP, Arthur, 1738–1814, an English navigator born in London, was the first colonial governor of Botany Bay, Australia. He was sent out in 1788, with 850 convicts, and a guard of about 200 officers and men.

PHILLIPS, a co. in e. Arkansas, bounded on the s.e. by the Mississippi, drained by the St. Francis river; on the Arkansas Midland and several other railroads; 650 sq. m.; pop. '90, 25,341 includ. colored. The surface is level, well wooded, swampy in parts, and exposed to inundation. The soil is fertile. The principal productions are corn, wheat, and cotton. Co. seat, Helena.

PHILLIPS, a co. in n. eastern Col. on the Nebraska border, formed from part of Logan; 570 sq m.; pop. '90, 2642. It is drained by Frenchman's creek. Co. seat, Holyoke.

PHILLIPS, a co. in n. Kansas, adjoining Nebraska, drained by Prairie Dog creek and the North Fork of Solomon river; about 900 sq.m.; pop. '90, 13,661, chiefly of American birth. The surface is rolling, with little timber. The soil is fertile, and well adapted to pasturage. Co. seat, Phillipsburg.

PHILLIPS, ADELAIDE, b. England, 1833; adopted the profession of the stage, and first appeared at the Boston museum, in 1843, as "Little Pickle." She played *soubrette* parts in that theater and at the Walnut Street Theatre in Philadelphia until 1852, when, having revealed her possession of a contralto voice of remarkable sweetness and compass, she was sent to Italy for study. She remained abroad two years, and made a successful *début* in Brescia, in 1853, in *Semiramide*. The following year she returned to the United States, and appeared in concert in the Music hall, Boston, making her American *début* in opera at the Academy of Music, New York, Mar. 17, 1856, in the part of "Azucena" in Verdi's *Il Trovatore*, in which she was entirely successful. In 1861 she appeared in this part in the Italian opera-house in Paris. She at once assumed the position of the leading contralto singer of America, which she held for many years. In 1869 she sang in the peace jubilee in Boston, and afterward traveled through the country, appearing in opera and concert. She d. 1882.

PHILLIPS, GEORG, 1804–72; b. Konigsberg; of English descent; studied law at Munich and Berlin; converted from Protestantism to the Roman Catholic faith. Associated with Görres, they established the *Historisch-Politische Blätter* in 1838, conducting it in the interest of the church of his adoption, its principles tending towards the re-establishment of the power of the Roman hierarchy, reducing the state to a mere administrative organ to execute the will of the church. In 1833 he was appointed professor of civil law at Munich, of canon law and legal history at Innspruck, 1849; of legal history, Vienna, 1851. Besides able works in defense of the church he published *Das Kirchenrecht*, 7 vols., 1845–69; *Lehrbuch des Kirchenrechts*, 2 vols., 1871, etc.

PHILLIPS, JOHN, LL.D., 1719–95; b. Boston; graduated at Harvard college, 1735; was licensed to preach, but afterwards engaged in mercantile pursuits at Exeter, N. H.; for several years was a member of the council of New Hampshire. In 1778, in connection with his brother, Samuel Phillips, he founded and endowed Phillips academy at Andover, Mass.; and a few years later established alone Phillips academy at Exeter, N. H., the endowment of which he ultimately increased to $134,000 by bequeathing to it two-thirds of his estate. He also endowed a professorship in Dartmouth college, contributed liberally to the college of New Jersey, and left one-third of his estate to Andover theological seminary in aid of students for the ministry.

PHILLIPS, JOHN, 1770–1823; b. Boston; graduated at Harvard, 1778; studied law and was made a judge of common pleas, 1809; state senator, 1803–23, and president of the senate, 1813–23; first mayor of Boston—which became a city in 1822—and father of the distinguished writer and lecturer, Wendell Phillips.

PHILLIPS, JOHN, 1800–74; b. Wiltshire, England; nephew of William Smith, often called the "father of English geology." From the age of 15 he accompanied his uncle in surveys and geological explorations in various parts of England. In 1827 he was made curator of the Yorkshire philosophical society, and delivered lectures on many scientific topics. He was a professor successively in Kings college, the university of Dublin, and of Oxford; and has published a treatise on geology and several special treatises.

PHILLIPS, SAMUEL, JR., LL.D., 1751–1802; b. Mass.; graduated at Harvard college, 1771; was a member of the provincial congress in 1775, and of the house of representatives until 1780, when, having assisted in forming the constitution of Massachusetts, he was elected to the senate, of which he was president, 1785–1802; was judge of the court of common pleas for Essex co., 1781–97; elected lieutenant-governor 1801. He was one of the projectors and a distinguished benefactor of the academies at Andover and Exeter, and one of the founders of the Boston academy of arts and sciences. At his death he left $5,000 to the cause of education, and afterward his widow carried out his wishes by joining in the endowment of Andover theological seminary.

PHILLIPS, STEPHEN CLARENDON, 1801–57, b. Boston; graduated at Harvard, and went into business. He served in both branches of the Massachusetts legislature, was a member of congress, 1834–38, and mayor of Salem, 1838–42. He was the free-soil candidate for governor in 1848 and 1849, and for several years a member of the state board of education.

PHILLIPS, WATTS, 1828–74; b. England; studied drawing under George Cruikshank, and at Paris. He was an artist of some reputation, but better known by his plays, of which the most successful was *The Dead Heart*. Among his other plays are *Joseph Chavigny; The Poor Strollers;* and *The Huguenot Captain*.

PHILLIPS, WENDELL, b. Boston, Nov. 29, 1811; son of Boston's first mayor. He graduated from Harvard in 1831, and from the Cambridge law-school in 1833; was admitted to the state bar, and practiced until 1839, when he retired from professional work on account of his unwillingness to be bound by an oath of fidelity to the U. S. constitution, as then construed by the supreme court. His first public appearance in the light of a reformer was in an impromptu speech of great eloquence at the Faneuil Hall meeting of Dec., 1837, held to denounce the murder in Alton, Ill., of the Rev. E. P. Lovejoy (q.v.). He was a warm supporter of Garrison and that party of abolitionists who believed the constitution to be void as upholding slavery against the "higher law." After the settlement of the slavery question by the war, Mr. Phillips was ever an eager advo-

cate of the woman's rights, temperance, and "labor-reform" movements, and in 1870 was the candidate of the labor-reform party for governor of Massachusetts. For many years Wendell Phillips was recognized as the first of public lecturers, and probably the best known of his lectures are those on *The Lost Arts* and on *Daniel O'Connell*. As an orator he stood unsurpassed in vigorous elegance and grace of delivery. He published many pamphlets on the questions in which he was so warmly interested, such as *The Constitution a Pro-slavery Contract* (1844); *Review of Webster's 7th-of-March Speech* (1850). A collection of his speeches, letters, and lectures was published in 1863 in Boston. Perhaps no speaker in the country elicited more admiration for finished and impressive address; while probably none elicited more adverse criticism for his views. The criticism, however, was aimed not at his moral principle, but at his intellectual method. He d. 1884.

PHILLIPS, WILLIAM, 1750–1827; b. Boston; having been prevented by poor health from acquiring a thorough education, entered early on mercantile life in connection with his father, from whom he inherited a large fortune. From 1794 until his death he was a deacon of the Old South church; was highly respected in the community, eminent both in church and in state, active in philanthropic labors; at one time lieutenant-governor of the state. His charitable contributions during many years averaged about $10,000 a year, and his legacies to various religious and benevolent institutions amounted to more than $60,000.

PHILLIPS, WILLIAM WIRT, D.D., 1796–1865; b. Montgomery co., N. Y.; graduated at Union college, 1812; studied theology four years in the seminaries at New York and New Brunswick; became pastor of the Pearl Street Presbyterian church, N. Y., 1818; and afterward for nearly 40 years of the First Presbyterian church, whose house of worship in Wall street was sold in 1844, after which a new edifice was erected on Fifth avenue and 12th street. He was moderator of the general assembly, 1835; for many years president of the board of foreign missions; a trustee of the College of New Jersey; a director of Princeton theological seminary, of the Sailors' Snug Harbor, and of other institutions.

PHILLIPS ACADEMY, Andover, Mass., endowed in 1778 by John Phillips, William Phillips, Samuel Phillips, and others, graduates of Harvard college. Its endowment is large, it has a library of 4000 volumes, and complete physical and chemical laboratories. Its principals have been men eminent for learning, and the roll of its alumni embraces many highly distinguished names. It has always stood in the highest rank of academies in this country. The education gained here by students in preparation for the great colleges is noted for thoroughness. In 1897 there were 20 teachers and 402 students. Principal, Cecil F. P. Bancroft, PH.D.

PHILLIPS EXETER ACADEMY, at Exeter, N. H., was founded in 1781 by John Phillips, LL.D., and is one of the most celebrated schools in this country for preparing boys for college. There is also an English course. It is well endowed. No. of students, abt. 300. Many men of distinction received their preparatory training here. Like the corresponding institution in Andover, Mass., it is not surpassed for thoroughness.

PHILO JUDÆ'US, *the Philosopher* (there being another Jewish Greek writer of this name), was born at Alexandria, about the time of the birth of Christ. Belonging to one of the most wealthy and aristocratic families—his brother was the Alabarch Alexander—he received the most liberal education; and, impelled by a rare zeal for learning, he, at a very early age, had passed the ordinary course of Greek studies which were deemed necessary for one of his station. Although every one of the different free sciences and arts included in the *Encyclika*, he says, attracted him like so many beautiful slaves, he yet aimed higher, to embrace the mistress of all—philosophy. Metaphysical investigation was the only thing which, according to his own confession, could give him anything like satisfaction or pleasure. The extraordinary brilliancy of his style, which, by his contemporaries, was likened to that of Plato—his rare power of thought and imagination, and an erudition which displayed the most astonishing familiarity with all the works of the classical Greek poets and philosophers, while at the same time it made him an adept in the fields of history, geography, mathematics, astronomy, physiology, natural history, music, etc.—could not but be of vast influence both upon his co-religionists and those beyond the pale of his ancestral creed. He had completely mastered the literature of his nation; but, strange to say, he chiefly knew it, as far as it was Hebrew, from translations. Thus, the Bible was only familiar to him through the Septuagint version, with all its shortcomings. When about 40 years of age, he went to Rome as the advocate of his Alexandrian brethren, who had refused to worship Caligula in obedience to the imperial edict. He has left an account of this embassy, into the result of which we need not enter here. Of his life we know little except what is recorded above, and that he once went to Jeruselem. His second mission to Rome, to the emperor Claudius, on which occasion he is said to have made the acquaintance of the Apostle Peter, as reported by Eusebius, is doubtful.

The religious and philosophical system of Philo Judæus, however, which is really the thing of most consequence, is most minutely known, and is deserving of the profoundest study, on account of the vast influence which it has exercised both on the

Jewish and Christian world. To understand his system aright, it will be necessary to remember the strange mental atmosphere of his days, which we have endeavored briefly to sketch in our introduction to Gnostics (q.v.). The Alexandrines had endeavored to make Judaism palatable to the refined Greeks by proving it to be identical with the grandest conceptions of their philosophers and poets, and had quite allegorized away its distinctive characteristics. Philo Judæus was the first man who, although himself to a great extent imbued with allegorizing tendencies, made a bold and successful stand against a like evaporization of the revealed religion of his fathers; which, indeed, in many cases had led people to throw off its yoke also outwardly. A most zealous champion of Judaism, his bitterness in rebuking those co-religionists who tried to defend their secret or overt apostacy by scoffing at the law itself, who were "impatient of their religious institutions, ever on the look-out for matter of censure and complaint against the laws of religion, who, in excuse of their ungodliness, thoughtlessly, argue all manner of objection"—knows no bounds. He cannot understand how Jews, "destined by divine authority to be the priests and prophets for all mankind," could be found so utterly blind to the fact, that that which is the position only of a few disciples of a truly genuine philosophy—viz., the knowledge of the Highest, had by law and custom become the inheritance of every individual of their own people; whose real calling, in fact, it was to invoke the blessing of God on mankind, and who, when they offered up sacrifices "for the people," offered them up in reality for all men.

To Philo Judæus, the divinity of Jewish law is the basis and test of all true philosophy. Although, like his contemporaries, he holds that the greater part of the Pentateuch, both in its historical and legal portions, may be explained allegorically, nay, goes so far even as to call only the Ten Commandments, the fundamental rules of the Jewish theocracy, direct and immedate revelations, while the other parts of the book are owing to Moses: he yet holds the latter to be the interpreter specially selected by God, to whose dicta in so far also divine veneration and strict obedience are due; and again, although many explanations of a metaphysical nature could be given to single passages, yet their literal meaning must not be tampered with. This literal meaning, according to him, is the essential part, the other explanations are mere speculation—exactly as the midrash and some church fathers hold Only that allegorical method differed in so far from that of his contemporaries, that to him these interpretations—for which he did not disdain sometimes even to use the numbers symbolically, or to derive Hebrew words from Greek roots, and the like—were not a mere play of fancy, in which he could exercise his powers of imagination, but, to a certain extent, a reality, an inner necessity. He clung to philosophy, as combined with the law. If the former could be shown, somehow or other, to be hinted at in the latter, then only he could be that which all his soul yearned to be—viz., the disciple of both: a Greek, with all the refinement of Greek culture; and a Jew—a faithful, pious, religious Jew. Nay, he even urged the necessity of allegory from the twofold reason of the anthropomorphisms current in scripture and from certain apparent superfluities, repetitions, and the like, which, in a record that emanated from the deity, must needs have a special meaning of their own, which required investigation and a peculiar interpretation. See MIDRASH, HAGGADA. Yet this fanciful method never for one moment interfered with his real object of pointing out how Judaism most plainly and unmistakably was based upon the highest ethical principles.

His writings develop his ideas and his system in the two directions indicated. In that division of his writings principally, which treats of the creation (*Kosmopoia*), he allows allegory to take the reins out of his hands; in that on the laws (*Nomoi*), on the other hand, he remains remarkably sober and clear, extolling the Mosaic legislation throughout, at the expense of every other known to him. In a very few instances only he is induced to find fault, or to alter slightly, by way of allegory, the existing ordinances.

His idea of God is a pre-eminently religious, not a philosophical one. He alone is the real good, the perfect; the world has only an apparent existence, and is the source of all evil. God is only to be imagined as the primeval light, which cannot be seen by itself, but which may be known from its rays, that fill the whole world. Being infinite and uncreated, he is not to be compared with any created thing. He has therefore no name, and reveals himself only in designations expressive of this "inexpressibility." He is also named the place (the talmudical *Makom*), because he comprises all space, and there is nothing anywhere besides him. He is better than virtue and knowledge, better than the beautiful and the good (*Kalokagatheia*), simpler than the one, more blissful than bliss. Thus, he has, properly speaking, no quality, or only negative ones. He is the existing unity or existence itself (ōn, *ŏn*), comprised in the unpronounceable tetragrammaton. As creator, God manifests himself to man, and he is then called "The beginning, the name, the word, the primeval angel." In this phase of active revelation of God, which is as natural to him as burning is to the heat, and cold to the snow, we notice two distinct sides, the power and the grace, to which correspond the two names of Elohim and Adonai, used in the Bible. The *power* also gives the laws, and punishes the offender; while the *grace* is the beneficent, forgiving, merciful quality. Yet, since there is not to be assumed an immediate influence of God upon the world, their respective natures being so different, that a point of contact cannot be found, an intermediate class of beings had to be created to stand between both

through whom he could act in and upon creation, viz.: the spiritual world of ideas, which are not only "ideals," or types, in the Platonic sense, but real, active powers, surrounding God like a number of attendant beings. They are his messengers, who work his will, and by the Greeks are called good demons; by Moses, angels. There are very many different degrees of perfection among them. Some are immediate "serving angels;" others are the souls of the pious, of the prophets, and the people of Israel, who rise higher up to the deity; others, again, are the heads and chief representatives of the different nations, such as Israel does not need, since they conceive and acknowledge the everlasting head of all beings, himself. The *Logos* comprises all these intermediate spiritual powers in his own essence. See article Logos for Philo's views on this part of his system. Man is a microcosm, a little world in himself, a creation of Logos, through whom he participates in the deity, or, as Scripture has it, "he is created in the image of God." He stands between the higher and lower beings—in the middle of creation. The ethical principles of Stoicism, Philo identified with the Mosaic ethics, in which the ideal is most exalted moral perfectibility or sanctity, and man's duties consist in veneration of God, and love and righteousness towards fellow-men. Philo holds firmly the belief in immortality. Man is immortal by his heavenly nature; but as there are degrees in his divine nature, so there are degrees in his immortality, which only then deserves this name when it has been acquired by an eminence of virtue. There is a vast difference between the mere living after death, which is common to all mankind, and the future existence of the perfect ones. Future recompense and punishment are not taken by him in the ordinary sense of the word. Virtue and sin both have all their rewards within themselves; but the soul, which is "pre-existing," having finished its course in the sublunar world, carries this consciousness with it in a more intense and exalted manner. Paradise is oneness with God; there is no hell with bodily punishments for souls without a body, and no devil in the Philonic system.—Philo's Messianic notions are vague in the extreme, and he partly even interprets certain scriptural passages alluding to some future redeemer as referring to the soul. Yet he indicates his belief in a distant time when some hero will arise out of the midst of the nation, who will gather all the dispersed together; and these, purified by long punishments, will henceforth form a happy, sinless, most prosperous community, to which all the other nations will be eager to belong.

We have only been able to indicate, in the slightest of outlines, the principal features of Philo's theology and philosophy, without endeavoring to follow any one of the manifold systematic schemes into which his scattered half-obscure dicta have been pressed. The influence Philo has exercised upon Christianity and Judaism (in the later writings of which his name occurs as "Yedidyah the Alexandrine") is enormous, and the various articles in the course of this work (Gnostics, Jews, Logos, etc.) dwell more or less upon this point. What he has done for the development of philosophy is discussed under that head and in the articles Plato, Neoplatonists, etc. Of the many works left under his name, several have been declared spurious, but in some cases, without much show of reason. His writings are generally brought under three chief divisions, the first of which comprises those of a more general and metaphysical nature, such as *De Mundi Incorruptibilitate, Quod Omnis Probus Liber, De Vita Contemplativa.* The second contains those written in defense of his compatriots, *Adversus Flaccum, Legatio ad Caium, De Nobilitate.* The third and most important is devoted to the interpretation and explanation of Scripture in the philosophical manner indicated, *De Mundi Opificio, Legis Allegoriarum Libri III.;* containing also a number of special treatises, *De Circumcisione, De Monarchia, De Præmiis Sacerdotum, De Posteritate Caini, De Cherubim,* etc.; five books *On the History of Abraham, De Josepho, Vita Mosis, De Caritate, De Pœnitentia,* etc.; to which also belong *De Parentibus Colendis, De Virtute eiusque Partibus,* first published by A. Maï; and certain very doubtful fragments, first discovered in an Armenian translation, such as *De Providentia* and *De Animalibus,* etc. Many of his works, however, seem irredeemably lost. The *editio princeps* by Turnebus, dates Paris, 1552; reprinted Geneva, 1613; Paris, 1640; etc. Mangey published a more critical edition (Lond. 1742, 2 vols. fol.), and Richter a slightly improved one (Leip. 1828–30, 8 vols.). An edition of Pfeiffer (1785, etc.) remained incomplete. Another edition was published by Tauchnitz (1851, etc.). There are several codd. in the Escurial, in Rome, and St. Petersburg.—Of the scholars who have written on Philo, we mention principally Dahl, Bryant, Gfrörer, Creuzer, Grosmann, Wolff, Ritter, Beer, and especially Drummond in an elaborate exposition of Philo's system. The English translation of Philo in 4 vols. forms part of Bohn's *Ecclesiastical Library.*

PHILOLOGY (Gk. *φιλολογία*; *φιλόλογος*: *φιλεῖν*, "to love;" *λόγος*, "word," "speech," "discourse," "argument"). The term philology has been made to include, in its most extended meaning, the whole intellectual development of a people from the earliest times to the present. Its material, in this signification, is not only language and literature and all that each implies, but it comprehends the entire historical growth of human culture. As it is more commonly used at the present day, it is restricted in its application to the phenomena of language, as such. In this sense philology is the science of language, which it treats as a physiological and a psychological product. Its aim is to account

for the general manifestations of language as a whole, and to trace its particular development among different peoples. By the comparison of different dialects, furthermore, it seeks to establish linguistic relationship where it may be discerned by its processes to exist, and by carrying back all cognate languages to the common source, to follow out in detail the individual growth of each.

In carrying out these latter phases of its task, philology makes use as a means not only of history in its most extended application, but of ethnology and archæology. Two of its most helpful handmaids are the related sciences of palæography and epigraphy. The science of philology, then, concerns itself not with a part, but with all of the problems of language. Its material is speech in its widest sense, whenever and wherever it has been used, whether as an unwritten dialect, or as the record of that which no longer exists as a spoken form. In its signification, as it is here used, of the science of language, it does not concern itself, on the one hand, solely with the etymology of words, as in some phases of its development it has seemed to do, or take account of words and phrases alone from their psychological side in their shifting change of content; neither, on the other, does it deal alone with speech as a phonological product. Both etymology and phonology enter as factors into language investigation, but they are parts, not the whole of the science.

Modern philology, in its use of means, is both historical and comparative. As will be pointed out further on, its earliest beginnings are to be found in descriptive grammar. The task of this last is to record, at any particular stage, the then existing facts of language, to exhibit, in other words, a language as it is. A series of such grammars, it is evident, for all periods of a language, would form together an historical grammar which would show the successive changes that the elements of the language had undergone. There would, however, come a time when the matter for such a grammar would necessarily fail, since back of all recorded material, in every language, lies the period when it only existed as spoken speech. Historical grammar alone, accordingly, if confined to a single dialect, is only able to account for the facts of language as they have been transmitted in that particular dialect. It is not always even able to do this, for many a problem insoluble, or wrongly solved, from the standpoint of one language alone, in which it is found to occur, is to be cleared up by the concensus of information derived from many. In order, then, to carry an investigation in language to its legitimate end, the method used must not only be historical, but by assembling all of the historically acquired facts in the different languages together, it must be comparative. Practically, it can only be in a true sense historical by being at the same time comparative, because in every language, as has been indicated, there are gaps that it is impossible to fill by a reference to that language alone. It was the application of the comparative method in language investigation, as will be explained, that first firmly founded the modern science of philology, which has been and still frequently is called comparative philology, unnecessarily, since to be scientific, at all, it must be comparative. One of the greatest results of these methods of comparison applied to language has been to establish a relationship between dialects, in many cases where it before had not been even remotely apprehended to exist, and to carry most of the languages of culture of the world back to an Indo-European parent speech, every detail of which has else been lost. By the wide observation, comparison, and classification of material gathered from every possible source, this genetic relationship of the dialects has not only been determined, but by processes of inductive generalization, used here, as in the other sciences, it has been possible to discover laws of far-reaching application, which, in their turn, may be applied deductively to explain the intricacies of language. When comparison has been spoken of, in the foregoing, in connection with grammar, it must not, however, be supposed that it is limited to the examination of grammatical forms and characteristics, as such. The whole vocabulary of the related dialects becomes, also, the subject of investigation in accordance with the common principles.

It is only by the use of discovered laws that philological processes have been made real. Early etymologists everywhere, among the Greeks, as among the Icelanders, fall into what, to us, are the most obvious errors, by their ignorance of the underlying principles of correspondence and differentiation. The exterior resemblance, then, as later, was thought to be the only requisite for tracing etymological relationship, as when, for instance, the identity was at one time assumed of *καλέω* and "call," *ὅλος* and "whole," as they may still be found in some English dictionaries. The wide application of law inductively acquired has not only put an end forever to all haphazard attempts to account for the history and kinship of words, but it has proved, among other things, that exterior similarity, or even identity alone, is the poorest possible criterion; that genetic relationship even, under conditions, presupposes diversity, and without that it not only cannot be proved to exist, but, on the other hand, may be proved not to be present at all. By Grimm's Law, for instance, Greek *κ* presupposes, under specific circumstances, an *h* in Germanic. *καλέω* is, accordingly, to be connected with L. calâre; O. H. G. holôn (halôn); O. S. halôn; A. S. holian=E. to hale. *ὅλος* in its turn is to be connected with Sanskrit sárvas; L. sollus; Goth. sêls; it is contained in A. S. sæl-ig, which is a very different word from *whole*=A. S. hâl; O. S. hêl; Goth. hails. The science of philology, finally, as a science which has to do with human mind, is an historical and not a physical science. As has been seen by the foregoing, its methods, too, are historical, as must be

its evidence and its verifications. It is in its processes of inquiry essentially inductive, and, like the other inductive sciences, may, in the end, use its generalizations for purposes of deduction. It is just here that the added evidence of the related sciences is of value, in the light of the substantiating proof that they may bring. The evidence of archæology, or of ethnology, has furnished in many ages corroborating support, while the known facts of history have, in countless instances, verified the inductions of philology, which without them would be, after all, but probable assumptions. It would be wholly possible without history, for instance, to prove the relation of the Romance dialects to Latin, or of English to the Low German of the continent. Philology, however, in all such cases is in position to contribute details that go far beyond historically transmitted facts. It is in this manner, in its turn, a most serviceable adjunct to history, and in some directions it furnishes not only the most conclusive, but almost all the testimony that we have. The great bulk of the information as to the very existence of a primitive Aryan people is furnished by philology alone. We are even able to reconstruct, by a rigid comparison of the related dialects independently of other testimony, which, in most cases, is absolutely lacking, many of the details of their life as they undoubtedly lived it. It is possible, in this way, to prove that the Aryans were a nomadic people, with only the beginnings of agriculture; they had wheeled vehicles, and although they moved about from place to place, they also constructed dwellings of such materials as wood, clay, and twigs; they made material to wear of flax and wool, but apparently knew no metal except copper; they had domesticated the cow, the sheep, and the dog, but none of the birds; they measured the year by lunar months and the month by nights.

In its origin and development the science of philology has been pre-eminently Indo-Germanic, and in its ordinary usage the term "comparative philology" is still only thus applied. This has resulted for several reasons. The modern languages of culture, among which the science has grown up, not only, almost of one accord, belong to the group, but the languages of the ancient nations from whom, above all others, that culture has been derived, are also included within it. Aside from this, the material over the length and breadth of the field is at the same time vastly more abundant, and from the accuracy of its transmission, and its own intrinsic character in general, is actually more important than is elsewhere the case. It is not, however, to be assumed that an investigation of the Indo-Germanic languages alone will be able to furnish a solution to all the problems of language. In the early days of the science it was tacitly taken for granted that all languages in their fundamental facts conformed to the same model, and that which held good of the Indo-Germanic group must necessarily hold good of all. This particular group, however, is, in reality, but one of many, and no more in this, than in any other similar case, is it possible to generalize from it alone. Its laws are its own, and general theories of language are only to be built up by an appeal to the non-related dialects, with which it has apparently nothing in common.

The development of a science of philology has not been, in its general features, unlike that of the other historical sciences. Like others, it began with the simple observation of facts. A general outline of grammar existed in the schools of the Greek philosophers. The critical study of Greek was first begun at Alexandria, where the great scholars of the day, notably Aristarchus and Zenodotus, the first librarian of Alexandria, were engaged in editing texts of the classics, and particularly of Homer. Under their influence, descriptive grammar made long strides in the development of a rational terminology. The first real grammar of Greek was written by Dionysius Thrax, a pupil of Aristarchus, who had settled at Rome. Of the popularity of Greek studies at Rome at this time and subsequently it is hardly necessary to speak in detail. What is scarcely less important, an influence was presently extended to the critical study of Latin. According to Suetonius, grammatical studies in Rome date from Crates of Pergamos, who about 159 B.C. gave public lectures on Greek grammar. Lucius Elius Stilo presently lectured in the same way on Latin, and his pupils, Varro, Lucilius, and Cicero, all became authorities on questions of grammar. The two former were authors of grammatical works, as was their contemporary, Cæsar himself. To the Greek grammar of Dionysius, descriptive grammar owes its fundamental terminology, which was speedily translated into Latin and used by all subsequent writers in its essential forms. During the succeeding centuries grammatical studies were not suffered to lapse. Prominent names are Quintilian, in the first century, Probus and Donatus in the fourth. After the seat of government had been transferred from Rome to Constantinople, we have, in the sixth century, the last great grammarian in Priscian. All of this early grammar was descriptive only; there was no thought of a systematic classification, or a comparison of languages, although, as early as Strabo, four of the Greek dialects were not inaccurately brought together. The classificatory stage in the development of the science properly began with the theologians of the sixteenth century, who had by this time extended their studies to the Semitic languages other than Hebrew.

Attention now began to be directed to linguistic questions on a broader basis. Bibliander, in 1548, published the Lord's Prayer in fourteen languages; Rocca, in 1591, in twenty-six; Megiserus, in 1592, in forty, and in 1593, in fifty. Early in the succeeding century, Estienne Guichard, in his *Harmonie Etymologique* (1606), distinguishes, although by no means correctly in their relationships, since he derives Greek from Hebrew, between four classes of languages corresponding to our modern Semitic, Greek, Italic, and Germanic. Scaliger, in his *Diatriba de Europæorum Linguis* (1610), distinguishes eleven

classes. A great stumbling block to the development of a rational classification at this time lay, however, in the unquestioned assumption that Hebrew was the primitive language of all mankind, and that, consequently, from it all languages may ultimately be derived. It was the service of Leibnitz (1646–1716), finally, to remove this obstacle and to establish the study of language, for the first time, upon a basis of inductive reasoning. At his instigation, a vigorous collection of facts was set on foot. Two great works at the beginning of the century, in this direction, owe their origin directly to his influence, namely, the *Catalogue of Languages* (1800), in six volumes, by Hervey, and the *Mithridates* (1806–17), in four volumes, by Adelung. What acted, however, more than all else to point out the true direction was the attention called in Europe to Sanskrit studies, by the establishment, in 1784, of the Asiatic Society at Calcutta, through whose publications, the language and literature first became accessible to scholars outside of India. One of its members, Sir William Jones, presently, in 1786, pointed out for the first time the unmistakable affinity existing between Sanskrit, Greek, Latin, Gothic, Celtic, and old Persian, which he affirms must have sprung from a common source. In Germany, the results of these new investigations were first utilized by Frederick Schlegel, who had studied Sanskrit in England, and who now, in 1808, published his work, *Ueber die Sprache und Weisheit der Indier*. It was this book which really gave the impulse to the foundation of the science of Indo-Germanic philology. Stimulated by it, Franz Bopp (1791–1867), the actual founder of the science, published at Frankfort-on-the-Main, in 1816, his book *Ueber das Conjugationssystem der Sanskritsprache in Vergleichung mit jenem der griechischen, lateinischen, persischen, und germanischen Sprache*. Bopp, in this first work on comparative grammar, identifies the personal endings of the verbs with originally independent pronouns, and recognizes in the Gothic verbs afterward called weak by Grimm, a union of the root with the preterite of the verb *to do*. A second, and still more important work by Bopp, was his *Vergleichende Grammatik des Sanskrit, Zend, Griechischen, Lateinischen, Gothischen, und Deutschen* (1833-52; third edition, 1869–71). The service rendered the new science by Bopp, from the side of comparative grammar, was more than paralleled by Jacob Grimm (1785–1863), the founder of historical grammar, whose great work, the *Deutsche Grammatik*, appeared in 4 volumes, 1819–37. Grimm, in this work, although the modern science has by no manner of means impartially accepted his conclusions, definitely pointed out the subsequent lines of its development. His grammar is not only historical, but it is at the same time comparative. What was most important for the establishment of the study upon a scientific basis was his first formulation of a law of sound, and his certain establishment of the fact that sound changes must and do take place along definite historical lines. Grimm's grammar, although primarily confined to the branches of a single language, is the first great fundamental work in the science of philology, and from the time of its appearance exercised an incalculable influence upon its development. The comparative method was first applied to the vocabularies of the Indo-Germanic languages by August Friedrich Pott (1802–88) in his *Etymologische Forschungen auf dem Gebiete der indogermanischen Sprachen* (1833–36; second edition, 1859–76). The two great summarizing works since Bopp are the *Compendium der vergleichenden Grammatik der indogermanischen Sprachen* (1861; fourth edition, 1876), by August Schleicher (1821–68), and the *Grundriss der vergleichenden Sprachwissenschaft der indogermanischen Sprachen* (1886–92), by Karl Brugmann, which last contains the latest results of the science.

It was the establishment of underlying law in sound change by Jacob Grimm that placed philology permanently on a scientific basis. His statement of the principle of consonantal change, as exhibited in the Germanic group of languages when contrasted with other members of the Indo-Germanic family, showed that such changes of sound in language exist in sequences wholly independent of chance or of volition on the part of the speaker, and it proved, furthermore, that these sequences of sound change are ascertainable along definite courses of development. It is the formulation of these principles of phonetic change that constitute the so-called "laws" of language. It must, however, be borne in mind that these are not physical laws with which we have here to deal. A sound law simply states the regularity observed within a certain group of historical phenomena; it does not, like a law of physics, state what must under given conditions invariably occur. The distinction is to be made, also, between sound change properly so called and that which is simply sound substitution at any given period in a language, as when, for instance, it is said in French grammar that "adjectives in *f* form their feminine by changing *f* into *ve*," as though the feminine form were then and there derived from the masculine, and had not, in its turn, regularly descended from the Latin feminine. Sound substitutions of this sort, and there are many of them, are the results of the working of phonetic laws, but they are not, thus stated, to be construed to express a law of sound change, which latter is invariably considered to mean an historical development that has been carried out within some particular period. The thesis is maintained by the modern school of philologists of the invariability of the working of the laws of sound. It is evident, however, that to be consistent and regular they can only concern themselves with absolutely similar phonetic conditions. In such circumstances, a sound must invariably have one and the same fate: either it must have changed throughout the particular language or dialect into the same other sound, or it must have remained constant throughout. Where a sound originally the same in an older stadium of the language is subsequently represented by various sounds, this may be shown conclusively to be due

to the effect of a difference in phonetic conditions, whether of accent, the influence of neighboring sounds, or the like. The "non-exceptional" working of phonetic law means no more than this. As the principle has concisely been stated: "A given sound in one and the same position cannot give rise to two different sounds."

"Grimm's Law" was originally formulated in the second edition of the first volume of the *Deutsche Grammatik*, which appeared in 1822. While the formulation of the process as a law unquestionably belongs to Jacob Grimm, the discovery of the fact of the existence of these particular series of sound changes does not. Single stadia of the process had long been recognized. Examples illustrative of the entire permutation, intermixed, to be sure, with many wrongly assumed phonetic changes, are contained in the *Svenskt Dialect Lexicon* of the Swede Joh. Ihre, which was published in 1766. Rasmus Kristian Rask (1787–1832), in his work on the origin of the Old Norse language, *Untersögelse om det gamle Nordiske eller Islandske Sprogs Oprindelse*, which appeared in 1818, gives the results of the process in all its details, with the exception that he makes Greek-Latin *b* equivalent to Germanic *b* (see below). To Grimm, however, belongs the merit of having brought the details together under a single formulation, and the law which thus arose, as is eminently fitting, received his name. It has, nevertheless, since his original statement of it undergone not unimportant correction. "Grimm's Law," or the First, or Germanic, Permutation of Consonants (*Lautverschiebung*), may be thus stated: Before the differentiation of the common, or primitive, Germanic language into the separate Germanic dialects, the Indo-Germanic tenues, tenues aspiratæ, mediæ, and mediæ aspiratæ underwent the following shifting: The Indo-Ger. tenues *p, t, k, q*, became in primitive Germanic the voiceless spirants *f*, þ(*th*), *h*, *h* (*hw*): e.g., Sansk. pad–, Gr. *πούς*, Lat. pēs, Goth. fōtus, A. S. fōt, foot; Sansk. tráyas, Gr. *τρεῖς*, Lat. trēs, A. S. þrī; Sansk. çvan–, Gr. *κύων*, Lat. canis, Goth. hunds, A. S. hund, hound; Lat. capio, Goth. hafjan, A. S. hebban, heave; Gr. *λείπω*, (*leiqo), Lat. linguō, Goth. leihwan, A. S. lēon (*lihan), lend. In the combination *s* + tenues the Indo-Ger. tenues remained unshifted, as did also the *t* in the Indo-Ger. combinations *pt, kt, qt*. The Indo-Ger. mediæ *b, d, g, g* (velar) became the tenues *p, t, k, k* (*kw*): e.g., Lat. lūbricus (*slūbricus), Goth. sliupan, A. S. slūpan, slip; Sansk. dáça, Gr. *δέκα*, Lat. decem, Goth. taíhun, A. S. ten; Sansk. jānu, Gr. *γόνυ*, Lat. genu, Goth. kniu, A. S. cnēo, knee; Lat. gelu, Goth. kalds, A. S. ceald, cold; Gr. *βίος* (*gīwos), Lat. vīvos (*gwīvos), Goth. qius (Ger. qiwis), A. S. cwicu, quick. The Indo-Ger. tenues aspiratæ became voiceless spirants in primitive Ger., and were thus merged with the voiceless spirants which arose from the Indo-Ger. tenues, together with which they underwent all further changes. The tenues aspiratæ were, however, of rare occurrence in Indo-Ger., and may be left out of consideration here. The Indo-Ger. mediæ aspiratæ first of all became voiced spirants; ultimately, original *bh, dh* initially, and *bh, dh, gh* medially after nasals became the voiced explosives *b, d, g*: *e.g.* Sansk. bhárāmi, Gr. *φέρω*, Lat. fero, Goth. baíran, A. S. beran, bear; Sansk. dhāma, Gr. *θή-σω*, Goth. ga-dēps, A. S. dæd, deed; Sansk. jámbhas, Gr. *γόμφος*, A. S. comb; Sansk. bándhanam, Goth., A. S. bindan, bind; root angh–, Gr. *ἄγχω*, Lat. angō, Goth. aggwus, A. S. engi (narrow). The changes here noticed were only gradual, and in their beginnings were doubtless already present in the parent language. There are varying theories as to the order in which they took place. It is probable, however, that the tenues first became spirants. The tenues aspiratæ and the mediæ aspiratæ then became, in the one case, voiceless spirants, in the other, voiced explosives. In this manner, as has been stated, the tenues and the tenues aspiratæ fell together. Finally, the mediæ became tenues. A second stadium of the process, commonly called the Second, or High German, Permutation of Consonants, subsequently took place within German territory itself, and differentiates the dialects of South Germany, or High German, whose consonants underwent the additional shifting, from the dialects of North Germany, or Low German.

As "Grimm's Law" had been formulated it still left unexplained a large number of instances which were originally considered as exceptions to its working. A considerable class of these so-called exceptions exhibited in Germanic, for Indo-Ger. p, t, k, at times *b, d, g*, instead of the regular *f*, þ(*th*), *h*. Karl Verner, in 1877, (in a paper in Kuhn's *Zeitschrift für vergleichende Sprachforschung*, vol. xxiii.) explained this irregularity, and established it under a phonetic law. It was proved that where the difference occurred it was connected with the earlier accentuation of the Germanic languages, which at one time corresponded with the free Indo-Germ. accent as exhibited in Greek, or more perfectly still, in Vedic Sanskrit. In the case of *bhratar*, for instance, the accent lay on the first syllable, but in the corresponding form *pitâr*, on the last; in Gothic we have *bropar*, A. S. *brôðor*, but Goth. *fadar*, A. S. *fæder*. "Verner's Law" is to be thus stated: After the first permutation of consonants had been completed, but before the principal accent was confined, as in later Germanic, to the root-syllable, a regular interchange took place between the voiceless and the voiced spirants. The spirants *f*, þ(*th*), *h*, *hw*, *s*, medial or final, became *b, d, g, gw, z*, except in the combinations *ft, fs, ht, hs, sp, st, sk, ss*, when the vowel next preceding them did not bear the principal accent: e.g. Sansk. pitár-, Gr. *πατέρ-*, Goth. fadar, A. S. fæder, father; Sansk. çatám, Gr. *ἑ-κατόν*, Lat. centum, Goth., A. S. hund, hundred; Gr. *ἑκυρά*, A. S. sweger (mother-in-law); Gr. *δεκάς*, A. S. -tig (decade). The process called by Holtzmann "grammatical change," in the Germanic languages, owes its origin to differences in accentuation under this law: e.g. A. S. *céosan*, has in the past sing. *cēas*, plur. *curon*, past part. *coren*; *snidan*, in the same way, has *snâð*, *snidon*.

sniden ; têon has *téah, tugon, togen,* which differentiation is due to the fact that in the infinitive and the past sing. the accent fell, as now, upon the first syllable ; in the past plur. and the past part., however, it originally fell upon the termination. In the case of *céosan, lêosan.* and the like, the Germ. *z* was regularly developed to an *r*, as above, in some of the languages of the group. "Verner's Law" was of extraordinary importance to the science of philology, not merely because it cleared up a hitherto inexplicable phonetic condition, and directed attention to the weighty part played by accent in the development of sounds, but even more than this, because it proved conclusively the wider and surer range of law in language changes. It showed that if two sounds were developed out of what was originally one and the same sound, it was not a matter of chance, but that there were definite reasons for the differentiation. It stamped the whole manner of procedure in philological investigation, in short, as indubitably real and scientific, and beyond the imputation of haphazard, which had often enough been cast upon it in its earlier days. Verner, in his formulation of the law, recognizes this fact in that he appends, as a corollary, the statement : "The First Permutation of Consonants does not permit, aside from the preservation of consonants in some certain complexes, a mass of exceptions." "Verner's Law" has since been widely applied, and its scope has been extended. Conway has used its principle to explain the absence of rhotacism in certain Latin forms ; we have, for instance, *âsinus, caêsariês, vâsum,* but *gêneris, gerêbam, Aurêlius, nâris.* The law cited under his name is to the effect that : Wherever in Italic an *s*, medially between vowels, followed an accented syliable, the resultant was a *z* in the non-rhotacising dialects, like Oscan, but *r* in the rhotacising dialects, like Latin and Umbrian ; if the accent immediately preceded, the *s* was preserved, except in Latin and Faliscan, where, nevertheless, the change to *r* still took place if the *s* was followed by *i* or *u*, and the same vowels, or a long vowel or diphthong, preceded. Moulton, in the law cited under his name, uses the principle of "Verner's Law," again, to account for the presence of a tenuis in Greek, instead of the regular hard aspirate. His own formulation is that : "Original hard aspirates lose their aspiration in Greek, except where the accent immediately precedes." We have, for instance, *οἶσθα* and *ἐστέ* (Sansk. sthá) ; Sansk. -thá and Gr. *-τός* ; Sansk. mithás and Gr. *μετά.* "Siever's Law" takes account of the fact that in place of the *gw*, which by "Verner's Law" should appear in primitive Germanic for original *hw*, there is found, in unaccented syllables, by "grammatical change" a *w*. We have, in this way, in Goth. *mawi*, maid, instead of *magwî* ; A. S. *gesewen*, instead of *gesegwên.* "Paul and Kluge's Law" accounts for a class of exceptions to "Grimm's Law" in which *gg, dd, bb* (which have arisen either from Indo-Ger. *ghn, dhn, bhn*, by "Verner's Law" from *kn, tn, pn*, or from original mediæ plus *n*), become *kk, tt, pp*, when the accent originally followed.

Leskien, in his work, *Die Deklination im Slavisch-Litauischen und im Germanischen* (1876), first expressed the thesis of the invariability of phonetic law. The statement was not only not allowed to pass unchallenged, but met with active opposition. Philologists were presently divided into two parties, and the so-called "new school" of philology arose, which has ultimately remained in possession of the field, and has given to the science its present form. The new school based its assumptions primarily upon the doctrine of the non-exceptional working of the laws of sound change, which it endeavored to carry out with far greater consistency than before. The physiology of sound, as exemplified in language, was made the subject of more careful investigations, and the results were more strictly applied to explain the phenomena of change. Many apparent irregularities in sound were in this manner proved to be, in reality, due only to their graphic representation. Factors like accent, that had before not been sufficiently taken into consideration, were found to be capable of wider application. In particular, the principle of the working of "false analogy," so called, received a complete justification as a working factor in language change in all periods of its history, instead of being considered an irregularity of only incidental occurrence. The new school, accordingly, has simply carried forward to their fullest conclusion principles already established as fundamental. Philologists like Georg Curtius (1820–85) and Schleicher, who represented the opposition to the newer views in their entirety, are by no means to be adjudged in contempt of phonetic laws, which they applied more consistently than did their predecessors. They did not, however, believe in the unvarying character of their working. Curtius, particularly, held to and sought to justify, beside the regular sound changes covered by law, irregular or "sporadic changes"—changes, namely, that were found in some instances, only, in the occurrence of a sound, and not in all under identical circumstances. The new school, with their thesis that phonetic law is invariable, rigidly exclude the possibility of "sporadic change." A sound change within a given area of speech at a particular phase of its development will not be found to occur in one instance and to be wanting in another. The same sound under similar circumstances will be similarly affected.

One of the most important services of the new direction in philological investigation has been to call increased attention to the fundamental conditions of language development in general. If the external characteristics of language as a physical product had been more accurately investigated in the light of the more perfect elaboration and application of the science of phonetics, so its internal characteristics as a psychological product were now observed with greater care. Steinthal, particularly in his work *Einleitung in die Psychologie und Sprachwissenschaft* (1871), among others, has investigated

language from its psychological side, as has also Whitney, in a more popular way, in his *Language and the Study of Language*, and *The Life and Growth of Language*. The application of the facts of the psychology of language to the details of the modern science has been the service, before all others, of Hermann Paul, whose work, *Principien der Sprachgeschichte*, appeared in 1880. Paul here definitely directs attention to the important part played by analogy in language change. Single words attract each other in the human mind, the result being the appearance of a quantity of larger or smaller groups; such an attraction, furthermore, always being dependent either upon a correspondence of the sound, or of the meaning, or of both conjoined. Analogy, in this way, is a conservative force in language, and works to secure its transmission and its continuity with at least some degree of regularity. It is, however, for just this reason, a destructive force, since the tendency toward regularity and uniformity not seldom results in destroying forms which do not conform to some given group. It is, however, at other times distinctly a creative force, and all living languages are constantly being added to by the creation of new forms on the analogy of those already existing. There is no reason to suppose that analogy has not operated in these directions at all periods in the history of a language. A particular effect of the working of analogy is the reaction against isolation of form. It has had, in this way, a "leveling" tendency, whose result has a most important bearing upon a true appreciation of the processes of change. By comparing the associated groups present in our own consciousness with those which it can be proved existed in a past period of the language, it will readily be found that in many instances forms previously connected are no longer considered to belong together. This has been the result, principally, of a change in sound, or a change in signification. A familiar instance of this process of isolation is the word *forlorn*. By the operation of "Verner's Law," *forloren* was the regular past part. of the A. S. verb (*for*)*lēosan*,—*lēas*, —*luron*,—*loren*. There is no thought now, however, of a connection with *to lose*; it has been completely isolated from its original grouping. *Forlorn* is the survival of a group which well illustrates, as a whole, the tendency of language to react against formal isolation. Instances were cited under "Verner's Law," in which the past plur. and the past part., by "grammatical change," had a different consonant from the present and the past sing., like A. S. cēosan—cēas—curon—coren. Already in Anglo-Saxon the traces of this process in many cases has disappeared by the intrusion of the consonant of the present stem, with the result that all tenses in these, as was the case in the great majority of verbs, exhibited the same consonantal conditions throughout. Those forms which still retained the older consonant became, as a consequence, more and more isolated from the groups with which they were really connected, and in their turn were ultimately merged with what were felt to be the normal forms. In the noun declension almost all traces of the working of this law had disappeared even in earliest Germanic. It has been pointed out that if phonetic development were the only agent in the history of language, the result would be an infinite variety of forms only loosely connected, or even, it may be, absolutely unconnected. The tendency to react against isolation is a unifying force that must be taken into strict consideration in etymological processes on account of its effect to obliterate previous phonetic conditions which, in many cases, the laws of language alone can show to have once prevailed. The controlling principles in this matter of isolation, and the reaction against it, are formulated as follows: "The greater the phonetic distance of two differentiated forms the greater is the power of resistance against unification and equalization." By virtue of this principle we still have, for instance, *forlorn* from *lose* and *sodden* from *seethe*. "The closer the etymological connection is between differentiated forms, the sooner will unification be effected." Various forms of the same tense, for instance, or the various cases of the same noun are felt to be more closely connected than are the various tenses of the same verb, or the nouns of the same declensions, and consequently they are much more readily affected. A third principle is that "the greater the intensity with which differentiated forms are impressed upon the minds of the community, the greater will prove their power of resistance against unification." Sometimes a differentiation in form coincides with a difference in function, although in its origin there was no necessary connection between them. In such a case the phonetic condition is strengthened to persist, and in its turn may become associated with the difference in function to the extent that it is supposed absolutely to indicate it. Such an instance is found, for example, in the plurals of *tooth, foot, man*, formed by *umlaut*, viz., *teeth, feet, men*. Originally, however, *teeth, feet, men* were, in the same way, found in the dat. sing., as well as the nom., and acc. plur.; the rest of the sing., the nom., acc., and gen., had a different vowel, e.g., *fōt, fōtes*, which presently made its way into the dat.; the whole sing. thus had its distinctive vowel, which was now contrasted with that of the nom. and acc. plur.; this, in its turn, crowded out the vowel felt to belong to the sing., from the gen., and dat., e.g. *fōta, fōtum*, and the umlauted form became indicative of the plural and the plural alone.

If the effect of phonetic change is, in manifold instances, to produce differentiation which did not originally exist, it is, nevertheless, in many others to obliterate differences that once existed. In this way sound change, again through the working of analogy, operates to produce new groups. The simplest operation of this process is seen where words unconnected, either by etymology or by signification, acquire the same form. Of this character are, for instance, *grave* (A. S. *grāfan*)—*grave* (Fr. *grave*, Lat. *gravem*); *pale* (Fr. *pal*, Lat. *pālum*)—*pale* (Fr. *pâle*, Lat. *pallidum*). A second process of the kind is exhibited in forms in which by phonetic development merely a close resemblance had

been produced, and one form or the other was then changed on account of its supposed connection with the rest. So-called popular, or "folk," etymologies fall under this head, as where, for instance, *sparrow grass*, or even *grass*, appears for *asparagus*. Phonetic development has worked even more actively in the grouping of the systems of inflection. This is again a most important matter in comparative grammar. It has made itself felt in two directions. In the one, forms which have had identical functions come ultimately to coincide; in the other, coincidence is exhibited in forms which have originally had different functions. "Leveling" of the character first mentioned has acted beneficially toward a simplification of language without any apparent disadvantage. In Gothic, for instance, the comparative of adjectives was formed with the suffix *-iz* or *-ôz*, the superlative with *-ist* or *-ôst;* in O. H. G. the comparative and superlative were *-iro*, *-ist*, or *-ôro*, *-ôst;* in A.S. there was but a single termination for the comparative, i.e., *-ra*, but still two for the superlative, viz., *-ost* and *-est*, which in modern English has been reduced to *-est* alone. Such a convergence, however, is not necessarily so complete. In the case of inflections, words originally belonging to one system have not infrequently, in much the same way, gone bodily over to another. Sometimes, on the other hand, this convergence has exhibited itself in some forms alone, but in all words of certain groups, or it has possibly affected only some forms of some words. The history of declensions in the Germanic languages, for instance, furnishes abundant instances of the leveling results of these processes, and it is only by an appeal to comparative grammar that it is possible to reconstruct original conditions. Even in Gothic, the declensions are found to be merged, and modern English shows the ultimate result of such a process. In the case of the coincidence of forms which have had at one time different functions, examples are not far to seek. Our own personal pronouns furnish a striking case in point, as do the strong verbs in the frequent convergence of the past sing. and plur. and the past part. into one and the same form. The recognition of the undoubted tendencies of analogy, both before and after the working of any given phonetic law, is one of the most instructive phases of the modern science. It has cleared up many apparent inconsistencies in the development of forms, and must, henceforth, be used as a working factor in all investigations of the problems of language.

According to their principle of formation the languages of the world are classified, and within the classes thus formed groups or families of language are distinguished, whose members are genetically connected with each other, in that all are descended from a common parent speech. Such a classification is, accordingly, on the one hand, morphological; on the other, genetic. In the one case it is exhaustive, in that all languages are comprehended within it; in the other it includes only those between which relationship has as yet been proved to exist. In accordance with their manner of formation, two great classes of languages are made: the one Isolating, or non-inflexional; the other, Inflexional. The Isolating languages show an absence of all inflexional structure. Such languages are, for instance, the Chinese, the Siamese, and the Tibeto-Burman group. The Inflexional languages exhibit the process of inflexion in all phases of completeness. Some of them, like the so-called "agglutinative" languages, possess it only in a slight degree. Their elements are only loosely aggregated in words and forms, which often take the shape of intricate derivatives, with varying degrees of obliteration in the form of their constituent parts. Such languages are, for instance, the great Turanian group, which includes, among many others, Turkish, Finnish, and Hungarian, and the Malayo-Polynesian languages. The "poly-synthetic" languages also exhibit agglutination, but specifically tend toward an absorption of the whole sentence into the verb, with the effect that the several parts of a sentence are fused into a single word. Such languages are those of the Indians of both North and South America. The "incorporating" languages, also agglutinative, incorporate into their verb relations, else usually expressed by independent words. Such a language is Basque. Other languages are sometimes specifically classed as "prefix-pronominal," like the Kafir dialects, or "semi-inflexional," like Hottentot.

Languages of the purely inflexional type are those belonging to the Semitic and the Indo-Germanic families. The Semitic languages exhibit inflexion in its most perfect form. In addition to inflexion by terminations, as in our own group, they are characterized by two distinctive peculiarities, viz.: the triliteral nature of the roots and their inflexion by variation of internal vowel. The Semitic root, namely, is made up in each instance of three unvarying consonants, the varying forms of the idea being expressed by change of vowel. Next to the Indo-Germanic family, they have been most thoroughly investigated from a modern standpoint, with the result of a well-founded science of Semitic philology, whose domain is being constantly extended.

Inflexion in the Indo-Germanic languages is a process that has only been gradually developed. Back of the inflexional period was a root period, so called, when suffixes were not yet attached to words. These suffixal elements are of two kinds, formal and inflexional, the latter being either case or personal endings, or stem-forming suffixes. Both word-formation and inflexion, accordingly, arose by composition, but many of the suffixes, even in the Indo-Germanic period, were no longer felt to be parts of a composition. The process is, then, a fusion of independent elements in both derivation and inflexion. To find the root of a word, it is in general terms necessary to remove from it all formative elements. It is not, however, certain that the forms thus arrived at actually represent the words of the root period, since both the analysis of the suffixal elements is uncertain and inflexional compounds were early subjected to phonetic change.

Whether the roots were only monosyllabic, or only polysyllabic, or were both, it is impossible definitely to say.

The Indo-Germanic family has been variously called. This particular appellation was chosen by Bopp, and has now generally been sanctioned by scientific usage. It indicates the entire speech area of the family, from India to its farthest limit in the Germanic north. "Indo-European" is often used in its stead. "Sanskritic" and "Japhetic" were terms of earlier application that have been discarded. The name "Aryan," which is due to Max Müller, is now less frequently applied to the family of languages as a whole than to the Indian-Iranian group, or to the primitive people of the race. The Indo-Germanic family of languages falls into eight main groups or branches. These are: (1) Aryan. This consists of the Indian and Iranian minor groups. The oldest dialect of the Indian group is the language of the Veda, the most archaic parts of which are supposed to go back as far as 1500 B.C. Sanskrit, strictly so called, or classical Sanskrit, is the continuation of a dialect that existed parallel with that of the Veda. It became the literary language of India, and as such acquired a fixed and artificial form. Prākrit, of which as early as the third century B.C. there were three principal dialects, was the vulgar language. As Pāli it became the literary language of Buddhism. From the dialects of Prākrit have descended the modern Indian languages: Hindi, Hindustani, Bengali, Maharatti, Scindhi, Punjabi, and others, together with the Romany (Gipsy) dialects. The oldest dialects of the Iranian group are Old Persian (West Iranian), the language of the Persian cuneiform inscriptions, from about 520–350 B.C., and Avestan, also called Zend and Old Bactrian (East Iranian), the language of the Zoroastrian Avesta. Two dialects are distinguished in the Avesta, the less archaic of which is called Later Avestan, or Zend in a strict sense. Neither Old Persian nor Avestan has direct descendants. The Modern Persian dialects, Kurdish, and Ossetian, are more nearly related to the former, and Afgan (Pastu) to the latter. (2) Armenian. The literary language, Old Armenian, goes back to the fifth century. The modern dialects are widely separated from the literary language. (3) Greek. Various dialects are found to occur at the beginning of the historic era. These are classified as follows: Ionic-Attic; Doric; North-West Greek; Æolic; Elean (which may belong to the North-West group); Arcadian-Cyprian; Pamphylian. The dialects are found in a pure form almost solely in inscriptions. The earliest literary language exhibits artificialities of construction. Out of the Attic dialect a common literary language was developed toward the end of the fifth century B.C. Modern Greek is divided up into a multitude of dialects. (4) Albanian. This, the language of ancient Illyria, has only been known to us, to any great extent, since the seventeenth century, and has, as yet, been insufficiently investigated. (5) Italic. The branch consists of Latin, and the Umbrian-Samnitic dialects. Latin is known to us since about 300 B.C. The literary language had already been differentiated from the popular dialect at the beginning of the archaic period of literature, and this process was still further developed in the classical period. The popular dialects of Latin come to light again in the Middle Ages in the various provinces of the Roman Empire. They ultimately developed into the important group of the Romance languages, whose members are: Portuguese, Spanish, Catalanian, Provençal, French, Italian, Rætoromanic, and Roumanian. The Umbrian-Samnitic dialects are known through inscriptions from the last centuries before the Christian era and through words quoted in Latin authors. Umbrian and Oscan are best known. (6) Keltic. The languages of this branch are divided into three groups: Gallic, Britannic, and Gaelic. We have only an imperfect knowledge of Gallic through words quoted in Greek and Latin authors, and from inscriptions. Britannic is divided up into Cymric (Welsh), Cornish, and Bas Breton (Armorican). It is possible to follow Cymric and Bas Breton since the eighth or ninth century, and Cornish somewhat later. The former still survive; Cornish became extinct at the beginning of the present century. Gaelic is made up of Irish, Scotch (or Gaelic in a strict sense) and Manx, the dialect of the Isle of Man. Irish and Scotch, are scarcely differentiated in the ninth century. The oldest remains are the Old Gaelic Ogam inscriptions, so called, in runes, from about 500 A.D. Literary Irish begins in the eighth century, Scotch somewhat later. Manx has only been known to us during the last centuries. All three dialects survive. (7) Germanic. The Germanic branch is divided into three groups: Gothic, Old Norse, and West Germanic. Gothic, as a whole the most archaic language of the group, has been preserved principally in the Bible translation of the West Gothic bishop Ulfilas (311–383 A.D.). It is sometimes known as Moeso-Gothic, from the home of this branch of the Goths in the province Moesia. The East Goths, in the Crimea, kept their language to modern times, but it is unknown to us with the exception of isolated words. Old Norse (Scandinavian) is sometimes classed with Gothic, with which in some respects it closely coincides, as East Germanic. Down to the so-called Viking age (800–1000 A.D.) it was practically a single language, but later was differentiated into two groups: West Norse, consisting of Norwegian, Icelandic, and Faeroese; and East Norse, including Swedish, Gutnic, and Danish. The oldest remains are runic inscriptions, perhaps from the fourth century. West Germanic is made up of Anglo-Saxon, the progenitor of Modern English; Old Frisian; Old Saxon, sometimes called Old Low German, now Low German, or *Platt Deutsch;* Old Low Franconian, whose modern representatives are Dutch, Flemish, and the dialect of Lower Franconia; and Old High German, from which have come the dialects of Upper (South) and Middle Germany. The oldest literary records of these languages, with the exception of Frisian, date from the

eighth and ninth century; Frisian has been known to us only since the fourteenth century. (8) Baltic-Slavonic. The Baltic group consists of Prussian, Lithuanian, and Lettic. Of the first we have only imperfect remains from the fifteenth and sixteenth centuries. The others go back to the sixteenth century, and still survive. The Slavonic languages are divided into a South-Eastern and a Western group. The former consists of Russian (Great Russian and White Russian, Little Russian); Bulgarian; and Illyrian (Servian and Croatian, Slovenian). The latter includes Czech (viz., Czech in a strict sense, Moravian and Slovakian); Sorabian or Wendish; and Lechish (Polish and Polabian, or Elbe-Slavonian). All, with the single exception of Polabian, still survive. The most archaic language of the group is that called variously Old Slovenian, or Old Bulgarian. It was the language of the Slavonic apostles, Cyril and Methodius, in the ninth century, and became the language of the Greek Church. As modified through the influence particularly of Russian, it is commonly known as Church Slavonic.

All the languages thus enumerated form together the material of Indo-Germanic philology. By a comparison of the separate groups of the whole Indo-Germanic family, it is possible to deduce the stage of development that all must have possessed in common before their sharp differentiation into dialects. Such a stage is called the Indo-Germanic parent language, which is capable of reconstruction, both as to its suffixes of formation and inflection, and much of its vocabulary. The absolute homogeneity of such a parent speech, or of the people who spoke it, is, however, no longer assumed. Dialectic, as well as tribal differences, existed even in primitive times. While there was over the whole Indo-Germanic area, to a certain extent, a common linguistic norm, there were, on the other hand, characteristic deviations from it, in different parts of this territory; the sharper differentiations, which ultimately became the separate languages, being connected by transition dialects which only gradually shaded off into them. This transition theory is not only in accord with the laws of dialectic diffusion as we know it to exist, but it is better able to account for the facts of relationship between the members of the family than was the older "pedigree" theory, which assumed a development of dialectic difference only after the separation of a part of the people from the originally homogeneous whole. Greek, for instance, has correspondencies with Indo-Iranian on the one side, and with Latin on the other, which are readily accountable for by the conditions of transition. In the same way, Latin-Greek have peculiarities common to them alone, as have Keltic-Latin, and Sanskrit-Letto-Slavonic. The languages together, before the actual dispersion of the various peoples, would have, not identity, but, necessarily, a by no means inconsiderable degree of uniformity. Their common phonetic condition can be determined by a comparison of the sounds of the different groups, in the light of a knowledge of the laws of subsequent sound change. That they have common inflexional elements has already been stated. Their common vocabulary is approximately brought together by the presence in several groups geographically widely removed of the same word, although here the process is far less sure, as it is impossible with certainty to determine whether a word may not have disappeared entirely, or have been preserved in an isolated instance in a single group.

As to the original home of the Indo-Germanic people before the dispersion, and the consequent area of the common speech, theories are still widely at variance. Schrader, with great plausibility, makes out the locality of common European culture to have been the country between the Danube and the Black Sea on the south, the Dnieper on the east, the Carpathians on the west, and the swamps and forests of Volhynia on the north. The Indo-Iranian culture was in the ancient provinces of Sogdiana and Bactriana in Eastern Iran. An area suitable for the joint life of both is found in the basin of the Middle Volga, north of the steppes of the Caspian, a conclusion that is fairly well substantiated by the character of the common vocabulary.

The grouping of the Indo-Germanic family, as here given, is, of course, linguistic and not ethnological. It does not by any manner of means follow that the people who now speak, or who spoke in past periods, the related dialects of the family, or of the group composing it, necessarily belong to the same race. As it has been concisely put, "language and race are not convertible terms." History has numerous instances of the displacement of one language by another. This was the case, to cite single examples, in Gaul and Spain, where Latin crowded out Keltic; in Prussia, where German has dispossessed Slavonic; in Ireland and Cornwall, where English has taken the place, again, of Keltic dialects; the Normans in France and England, and the Franks in Gaul, gave up their language for that of the people they had conquered; and a modern instance of a community as heterogeneous as possible from an ethnological standpoint, but speaking the same language, is furnished by our own. That this same process happened in the remotest past is not only possible, but probable. It does not, however, in any way disprove the idea of such a fundamental linguistic relationship as has been described, or the original unity of an Indo-Germanic people.

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PHILOME'LA, the name of a personage in Greek legend, who was changed according to one account into a swallow, to another into a nightingale. Modern poets are (or rather were, for it was chiefly an 18th c. fashion) fond of calling the nightingale by its classical name.

PHILOPŒ'MEN, the most illustrious patriot and general who figures in the later history of Greece, belonged to one of the best families of Arcadia, and was b. at Megalopolis about 252 B.C. At an early age he lost his father, and was brought up by a wealthy citizen, named Cleander, who took care that he should receive an excellent education. His earliest experiences of war were confined to the border raids of the Arcadians into Laconia; but in 222 B.C,, he was one of the defenders of Megalopolis against Cleomenes, king of Sparta. Next year, when the Macedonian king Antigonus marched to the assistance of the Achæans, Philopœmen joined him at the head of 1000 horse, and contributed materially to the terrible defeat which the Spartan king received at Sellasia. As tranquility was now for a short time restored to Greece, Philopœmen went abroad to perfect himself in the art of war, and served in Crete with such distinction, that on his return to the Peloponnesus, in 210, he was appointed general of the Achæan horse, and at once proceeded to discipline his men in a vigorous and masterly style. In the expedition against Elis (209) he slew the Elean leader, Demophantus, with his own hand. In 208 he was raised to the highest military dignity then possible in Greece, being elected *strategus* or commander-in-chief of the Achæan league, and in this capacity signalized himself by the great improvements which he effected in the drill, discipline, and armor of the Achæan soldiery. It seemed as if the ancient heroism of the land were reviving. The battle of Manteneia, which took place in the course of the same year, and in which the Spartans were again utterly routed—their general and king, Machanidas, falling by the sword of Philopœmen himself—raised him to the pinnacle of fame, and at the Nemean festival which followed he was proclaimed liberator of Greece. His exalted honors did not in the slightest degree disturb the integrity of his character. So great was his influence over his quarrelsome countrymen, that the Macedonian monarch, Philip, began to fear that Greece would regain its independence, and tried to have him secretly assassinated; but the infamous treachery was discovered in time, and its only effect was to endear Philopœmen still more to the Achæans. Another of his determined enemies was Nabis, successor of Machanidas in the "tyranny" of Sparta, but in 201 he inflicted on the latter a severe defeat at Skotetas on the borders of Laconia. During the next few years he was absent in Crete, partly, it would seem, for political reasons, but returned to the Peloponnesus in 194 to find matters in a serious condition. A new and dreaded power—the Romans—had appeared, and overthrown both Philip and Nabis, and Philopœmen foreboded future mischief to all Greece from these ambitious warriors. On the departure of the consul Flamininus, Nabis recommenced hostilities against the Achæans; Philopœmen was once more appointed strategus (192); and in a pitched battle nearly annihilated the troops of Nabis, who himself was shortly afterward killed by the Ætolians. He now exerted all his power to head the divisions among the Achæans, and to prevent them from affording the Romans a pretext for taking away their independence. In 188, he took a fierce revenge on Sparta for having put a number of his friends to death, and was in consequence strongly censured by the Roman senate, and by Q. Cæcilius Metellus, who was sent out as a commissioner to Greece in 185. Two years later Philopœmen (now an old man of 70) was elected strategus for the eighth time. When lying ill of a fever at Argos, news was brought to him that the Messenians had broken their connection with the league; Philopœmen instantly rose from his sick-bed, hastened at the head of some cavalry to quell the revolt, but was overpowered by numbers, and fell into the hands of Deinocrates, the leader of the Messenians, who two nights after sent him a cup of poison, which Philopœmen drank off and died. The remains of the hero were brought in solemn procession to his native city—the historian Polybius carrying the urn—and statues were erected to his memory by his grateful and repentant countrymen.

PHILOSOPHICAL ANATOMY, an arrangement of anatomical science by which it is sought to exhibit the developmental connections between the various parts of one ani-

mal as well as correspondences between the organs of different animals. It therefore includes, or at least makes use of, comparative anatomy, but it aims to go a step farther, in establishing an archetype for all forms, belonging to each sub-kingdom of animated nature. This is the broadest definition, probably, that can be given, consistent with the very varied views which have been taken of the subject by different naturalists.

PHILOSOPHY. This word meant originally the "love of knowledge," and indicated, therefore, a special taste, appetite, or desire, of which the subject matter was knowledge. At first, man's pursuit of knowledge was subservient to the immediate uses of life; but, in the course of time, an interest was taken in knowing the order of the world, independent in its application to the common utilities. We find that this stage had been reached in Greece especially, about five or six centuries before Christ; at which time the name "philosophy" took its rise, being attributed to Pythagoras.

The word has a variety of acceptations, although all pervaded by the one idea of employing the human understanding in the search for increasing knowledge and certainty. It always implies this effort in a distinguished degree, such as only a few persons in any age have ever been able to sustain. The pursuit of knowledge had to become an end in itself, for the mere improvement or practice would not at first have been a sufficient motive for men to undergo the labors of scientific inquiry. Indeed, this improvement was not at all apparent as a consequence of the earlier efforts of speculation. As one celebrated example, the investigation of the properties of the sections of the cone—the ellipse, parabola, and hyperbola—was without any practical use for nearly two thousand years.

As may be readily supposed, the precise aim of philosophy, the statement of what constitutes its end, has varied with the advancement of its study. In modern times, the pursuit of truth has taken a well-defined tone, expressed by the name science (see SCIENCES). But in the ancient world this operation was a mixture of speculation, practice, and sentiment—of legitimate inquiry with aspirations after the unattainable; and hence the word "philosophy," in its modern employment, often refers to the subjects that have not as yet adopted the strict scientific form. On this view, science is the goal and grave of philosophy. (See Lewes's *Biographical History of Philosophy*.) It is chiefly with reference to morals, metaphysics, and the human mind generally, that the term is still retained.

The characters that distinguish the highest form of truth are generality and certainty or precision; and in proportion as a subject has advanced in these respects, it might be said to have become philosophical, but we now prefer to use the word scientific. The theoretical foundations of a practical subject, as grammar, are sometimes pretentiously called the philosophy of it. So any department of nature or humanity, where explanations by general laws are furnished, is styled "philosophical;" thus, we have the philosophy of zoology or of history, and a "philosophical" naturalist or historian.

Again, after definite branches of knowledge have taken a scientific shape, and have been reckoned as distinct "sciences" (mathematics, etc.) the general principles and views that are supposed to run through the whole, are sometimes called "philosophy." This was one of the meanings of the word in Plato. The great work of Auguste Comte bases its title (*Cours de Philosophie Positive*) upon this consideration.

Prof. Ferrier remarks that philosophy is not truth, but "*reasoned* truth;" that is, it must be truth presented under the forms and processes that evolve and establish the highest or scientific knowledge. This is merely another mode of stating that philosophy implies a special procedure for attaining truth, the ordinary unregulated operations of the understanding being insufficient.

Among the oldest problems of philosophy, we are to reckon the attempt to generalize the universe, or to resolve all nature into some great unity, or common substance or principle. Thales considered water the primordial and fundamental principle. Anaximander adopted as the foundation of the universe something called by him the infinite or indeterminate, out of which the various definite substances, air, fire, water, etc., were generated, and to which they were again resolved. Anaximenes assumed air as the primordial substance, which, by rarefaction, produced fire and ether, and by condensation, water, earth, and stone. These three philosophers all belonged to the Ionic colony of Miletus. Pythagoras was an emigrant from Ionia to Italy; he gave number as the essence and foundation of all existing things; the different numbers being representative of different natural properties and powers; thus, *five* stood for color, *six* for life, etc. Xenophanes of Kolophon attacked the popular polytheism, and propounded one great indivisible agency comprehending and identified with the universe, which he would not designate as finite or infinite, in motion or at rest. Parmenides of Elea distinguished between self-existent being, Ens, or the absolute, characterized by extension and duration, and phenomenal nature, the region of inferior certainty, or mere opinion. This was the first sketch of what has since been called ontology, or the science of the *noumenon*, or absolute being. Herakleitus of Ephesus maintained an absolute of a totally different character—a principle of incessant change, the negation of all substance and stability, a power of perpetual destruction and renovation. Empedocles took his stand upon the four elements, out of which all things were constituted by the action of the opposing principles of love, and enmity or discord—a poetical representation of attrac-

tion and repulsion. Anaxagoras also treated the world as made up of elements, but indefinite in number. By the attraction of each for its own kind, the primitive chaos was separated, but excepting "mind," no element ever was perfectly pure, the character of each substance being determined by the predominance of the proper element. These elements were called the "homœomeries." Diogenes of Apollonia, the last of the series called Ionic philosophers, adopted in a modified form the tenet of Anaximenes, that air was the primordial element. The celebrated atomic theory originated with Leukippus, but is commonly identified with his pupil Democritus of Abdera. The elements of Anaxagoras were acted on by mind, but with Democritus their activity was inherent in themselves from the beginning.

The grand problem of external perception (see PERCEPTION) was agitated at an early period, and has been always reckoned a leading question of philosophy. The first attempt at a solution was an application by Democritus of his atomic hypothesis. He supposed that all things were constantly throwing off images of themselves, which enter the soul through the pores of the organs of sense. He was aware that this left us in a state of uncertainty, as to whether the images corresponded to the otherwise unknown originals.

The many difficulties and uncertainties incident to the search for knowledge, could not but be felt by inquirers generally. There was one sect in particular, more especially impressed by this circumstance, and hence called skeptics, or doubters. They were represented in antiquity by Pyrrho. They dwelt on the absence of any sure criterion of truth, and pointed out that what was considered most certain was not free from objec tions, or counter-arguments.

Philosophical speculation began to take definite shape in the age of Plato and Aristotle, the age of the beginnings of many of the sciences. More especially at this time do we find the distinct enunciation of the philosophy of human life, otherwise called moral and ethical philosophy. The questions concerning the end of life, the pursuit of happiness, and men's duties in various relationships, had been answered by a sort of rule-of-thumb experience, rather than by deep reflection or far-seeing combinations. The distinctions of virtue and vice were determined by political society, and connected more or less with religion. There were tests and maxims of conduct, for the most part merely prudential. The first approach to a moralizing strain is found in the poems of Hesiod. He combines a gloomy view of life with much practical wisdom, enjoining justice, energy, temperance and simplicity of living The "seven wise men," who belonged to the 6th c. B.C., followed in the same course, and uttered a variety of sayings or short maxims, of which the most ordinary subjects were "the uncertainty of human things, the brevity of life, the unhappiness of the poor, the blessing of friendship, the sanctity of an oath, the force of necessity," etc., together with the simple rules of prudence. The most celebrated saying of this age was the Delphian inscription (of uncertain authorship), "Know thyself." The teaching of the Sophists made another stage in the history of moral philosophy. They opened up discussions on virtue, on justice, on the laws, and on happiness; and framed hortatory addresses with a view to moral culture. Socrates then came forward, and instituted a severe logical analysis of the meaning of ethical terms, asking "What is piety? What is impiety? What is the noble? What the base? What is just? What is temperance? What is madness? What is a state? What constitutes the character of a citizen? What is rule over man? What makes one able to rule?" The rigid search after strict definitions of these terms may be said to constitute a philosophical method in ethics, and hence Socrates is called the first moral philosopher. He gave the impulse to Plato, his successor, who in his turn acted upon Aristotle, and also to the opposing sects of the Cynics and the Cyrenaics—the one affecting a hard and ascetic life, and a proud superiority of the individual will to all outward conventions and customs; the other avowing pleasure as the chief good, sitting loose to the irksome duties of the citizen, and in despair of attaining happiness, sliding into apathy. The Stoics and the Epicureans afforded a similar contrast, although differently expressed. The Stoic ideal was a being in whom the natural impulses and desires should be absolutely subjected to highly abstract views of the universe; the Epicurean ideal was a being moving harmoniously according to natural impulses—in short, following nature up to the limits of prudence.

The last phase of ancient philosophy is represented by Neoplatonism (see NEOPLATONISTS), or the Alexandrian school. In the middle ages, speculative philosophy took the form called Scholasticism (see SCHOLASTICS). At the revival of learning, Descartes and Bacon led in opposite directions, the one representing what is called *à priori* philosophizing; the other, *induction* (q.v.). From this time, "philosophy" comes to mean more exclusively the inquiries connected with the mind, as exemplified in the writings of Hobbes, Locke, Leibnitz, Berkeley, Hume, Reid, Kant, etc. The qualified phrase, natural philosophy (in the English sense), was applied to a special department of the outer world, as moral philosophy was used in connection with mind and the discussion of moral duties. The chief points in the history of modern philosophy will be found under the heads of COMMON SENSE; ECLECTICS; ETHICS; GERMAN PHILOSOPHY; METAPHYSICS; PERCEPTION; and in the notices of BERKELEY; COUSIN; FICHTE; HAMILTON; HEGEL; HUME; KANT; LOCKE; REID, etc.

PHILOSOPHY, CONCORD SCHOOL OF. For many years Mr. A. Bronson Alcott had in mind the establishing of a school of philosophy, and in 1842 a philosophical library

was bequeathed to him for this purpose by James Pierpont Greaves, of England. In 1879 arrangement was made for a school, meeting at Concord, a vill. in Middlesex co., Mass.; and its sessions were to last five weeks during mid-summer. The first session was held at Mr. Alcott's old residence, *Orchard House*. The succeeding sessions were held in a building erected for the purpose called *Hillside Chapel*, capable of seating about 140 persons. Here many persons of note delivered lectures; besides Alcott, Emerson, the Rev. W. H. Channing, of England, S. H. Emery, jr., the director of the school, Prof. Wm. T. Harris, Pres. Noah Porter, of Yale coll., Dr. H. K. Jones, Mrs. Julia Ward Howe, and others. The audiences were principally composed of women. The idea of the school was to seek a surer basis for the truths by which we live and advance, and to apply practically to life what it found of good. Hegel, Plato, Shelling, the personality of God, recent thought concerning history, sociology, literature, and art are among the topics discussed. The school suffered a severe loss in the death of Emerson, 1882; and in 1883, owing to the illness of Mr. Alcott and to insufficient attendance, it practically lapsed; but subsequently was revived.

PHILOSOPHY, MORAL. See ETHICS.

PHILOSTRATUS, THE ELDER, of Lemnos, a famous Greek Sophist and rhetorician, was born probably about 170–80 A.D., studied under Proclus at Athens, and finally established himself at Rome, where he became a member of the brilliant and learned circle that gathered round the "philosophic" Julia Domna, wife of Severus. He was alive, according to Suidas, in the time of the emperor Philip (244–49). He is the author of a number of works still extant, and not without value on account of their matter, although the style and arrangement are faulty. Among them are a life of Apollonius (q.v.) of Tyana, a description of a collection of paintings at Naples under the title of *Imagines*, biographies of a number of sophists, *Heroica*, Letters, etc. There are complete editions of his works by Morel (Paris, 1608); Olearius (Leip. 1709); and Kayser (Zur. 1844, *et seq.*), of which the last is by far the most correct and critical.

PHILOXENUS, B.C. 435–380; b. in the island of Cythera; d. Ephesus: the last of the dithyrambic poets of Greece. When his birthplace was conquered by the Athenians, B.C. 435, P. was sold as a slave, passed into the hands of the dithyrambic poet Melanippides, and afterwards resided at the court of Dionysius, in Syracuse. He is said to have composed 24 dithyrambs and a lyric poem; but although some of these had great popularity, only insignificant fragments have survived.

PHIL'TER, PHILTRE (Gr. *philtron*, love-charm, love-potion). A superstitious belief in the efficacy of certain artificial means of inspiring and securing love, seems to have been generally prevalent from very early times; and among the Greeks and Romans (among the latter in the later days of the republic, and under the emperors), love-charms, and especially love-potions, were in continual use. It is not certainly known of what these love-potions were composed—nor can we rely entirely on the details given us on this subject by classic writers, and their commentators in later time—but there is no doubt that certain poisonous or deleterious herbs and drugs were among their chief ingredients, to which other substances, animal as well as vegetable, are said to have been added, coupled with the employment of magic rites. Thessaly had the credit of producing the most potent herbs, and her people were notorious as the most skillful practicers of magic arts, whence the well-known "Thessaly philtra" of Juvenal (vi. 610). These potions were violent and dangerous in operation, and their use resulted often in the weakening of the mental powers, madness, and death, instead of the purpose for which they were intended. Lucretius is said to have been driven mad by a love-potion, and to have died by his own hand in consequence—though the story does not perhaps rest on sufficient authority; and the madness of the emperor Caligula was attributed by some persons to love-potions given him by his wife Cæsonia—by which also she is said to have preserved his attachment till the end of his life. In the corrupt and licentious days of the Roman empire, the manufacture of love-charms of all kinds seems to have been carried on as a regular trade; the purchasers, if not the makers of them, being chiefly women. The use of philters seems to have been not unknown during the middle ages; and in the east, the nurse of superstition of all kinds, belief in the power of love-potions lingers probably down to the present day.

PHIPS, OR PHIPPS, Sir WILLIAM, 1651–95, b. Maine, removed to Boston in 1673. He was one of 21 sons, and 26 children by the same parents; was at first a shepherd, and then a ship-carpenter's apprentice, and did not learn to read and write till after he went to Boston. In 1684 he visited England, and secured from the British admiralty a ship, with which he attempted to recover the treasure of a Spanish vessel sunk near the Bahamas. His first attempt was unsuccessful; but on a second voyage at the expense of the duke of Albemarle, he recovered $1,500,000 worth of treasure. He received $80,000 worth himself, was knighted, and appointed high sheriff of New England. In 1690 he commanded the expedition which captured Port Royal, and the unsuccessful expedition against Quebec. Through the influence of the Massachusetts agent in England, Increase Mather, to whose father's church he belonged, he was made capt.-gen. and governor of the colony in 1692. He was a zealous Puritan, and assisted his pastor, Cotton Mather, in suppressing witchcraft, but his last official act was to pardon all persons accused or convicted of witchcraft. He died in England, where he had been summoned on account of some accusations against him.

PHLEBENTERISM is a term invented by De Quatrefages to designate an anatomical arrangement, existing, as he supposed, in certain of the nudibranchiate mollusks, and characterized by ramified prolongations of the digestive tube, in virtue of which the digestive apparatus, to a certain extent, supplies the place of a complete circulatory apparatus, and aids in the process of respiration. The researches of Alder and Hancock, and other zoologists, seem, however, to show that in these animals the circulation is as complete as in the gasteropodous mollusks generally, and that these ramified prolongations are of the nature of a rudimentary liver. For further information on this subject, the reader is referred to De Quatrefages's *Rambles of a Naturalist*, vol. i. pp. 348–353.

PHLEBI'TIS, or INFLAMMATION OF THE VEINS (Gr. *phlebs*, a vein), although seldom an original or *idiopathic* disease, is a frequent sequence of wounds, in which case it is termed *traumatic* phlebitis (from the Greek *trauma*, a wound), and is not uncommon after delivery. The disease is indicated by great tenderness and pain along the course of the affected vessel, which feels like a hard knotted cord, and rolls under the fingers. The hardness is, however, sometimes obscured by the swelling of the limb beyond and about the seat of the disorder, partly in consequence of the effusion of serum caused by the obstruction to the return to the venous blood (which thus gives rise to a local dropsy), and partly in consequence of the propagation of the inflammation to the surrounding tissues. The inner surface of the inflamed vessel is supposed to throw out fibrinous fluid, which coagulates in layers, and finally closes the tube. If the vessel is small, the consequences of its obstruction may be of little importance, but when a large vein is affected, the consequences are always dangerous, and may be fatal.

There are two modes of recovery: solution of the coagulated fibrine may take place, and the vessel may again become pervious; or, as is more commonly the case, the obstruction may continue, but a collateral venus circulation may be established, and the circulation thus carried on through a circuitous route. With the return of the circulation—in whichever of these two ways it is accomplished—the swelling subsides, and the patient gradually recovers. If, however, the disease advances, suppuration takes place within the coagulum, and one of two things happens; either abscesses are formed along the vein, or the pus gets into the current of blood and contaminates the circulation, giving rise to the perilous disease known as *pyæmia* (q.v.). Either condition is dangerous; the latter pre-eminently so.

Phlebitis generally originates in some local injury of a vein, and the inflammation, when once established, is readily propagated along the course of the vessel. Sometimes very slight injuries give rise to it. It occasionally occurs after venesection, especially with a dull lancet, or one soiled by contact with diseased matter. Women are peculiarly liable to this disease after delivery, as the veins of the womb are apt to become inflamed, and to communicate the inflammation to the venous trunks connected with them. See PHLEGMASIA.

PHLEB'OLITES (Gr. *phlebs*, a vein, and *lithos*, a stone) are calcareous concretions formed by the degeneration of coagulations in veins, or occasionally originating in the coats of the vessel. They are seldom detected till after death, although cases are on record in which, occurring in subcutaneous veins, they have given rise to external tumors of considerable size.

PHLEBOT'OMY. See BLEEDING.

PHLE'GÉTHON, i.e., the Flaming, a river of the infernal regions, whose waves rolled torrents of fire. Nothing would grow on its scorched and desolate shores. After a course contrary to the Cocytus (q.v.), it discharged itself, like the latter stream, into the lake of Acheron.

PHLEGMA'SIA, AL'BA DO'LENS, or MILK-LEG, is a disease which is most common in women after parturition, especially if they have lost much blood, but sometimes occurrs in unmarried women, and occasionally in males. It usually commences about a week or ten days after delivery with a feeling of pain in the loins or lower part of the abdomen, whence it extends to the groin and down the thigh and leg. The pain soon becomes very severe; and principally follows the course of the internal cutaneous and crural nerve of the thigh and of the posterior tibial in the leg. The limb soon begins to swell, and in the course of a couple of days is sometimes twice its ordinary size, and as the swelling develops itself, the acuteness of the pain considerably diminishes. The limb is partly flexed, and lies motionless; any movement aggravates the pain. The swelling extends uniformly over the limb, which is pale and shining, and hot and firm to the touch, seldom pitting on pressure. The femoral vein may usully be felt like a hard cord, and this symptom, taken with the swelling, clearly indicates that this affection is essentially *crural phlebitis*. The uniformity of the cord is interrupted by nodules, arising either from inflamed cellular tissue, or from clots within the vein. Both legs are seldom attacked at the same time, and the left thigh is the most common seat of the disease.

This affection usually terminates favorably, the acute symptoms disappearing in about ten days or a fortnight. The swelling, however, often continues for a long time, and sometimes lasts for life. Very different opinions have been held regarding the nature of this disease. At one time it was considered as the result of metastatic secretion of milk (or, in other words, as due to the milk leaving the breast, and settling in the thigh, and

hence the term *milk-leg*. There is now no doubt that the disease is inflammation originating in the veins of the womb, and extending to those of the lower extremity. The treatment is the same as for phlebitis (q.v.) generally. Warm poppy fomentations, or bran poultices sprinkled with laudanum, may be applied externally at the beginning of the attack, after which flannel saturated with a liniment, composed of one part of laudanum to two parts of soap liniment, may be applied round the limb in the form of a bandage, applied not so tightly as to occasion pain. If necessary, the bowels must be gently opened with castor oil, and opium given to allay pain and induce sleep.

PHLE'UM. See TIMOTHY GRASS.

PHLOGIS'TON (Gr. *combustible*) was the term employed by Stahl, professor at Halle, in his *Zymotechnia Fundamentalis*, 1697, to designate a hypothetical element which by combining with a body rendered it combustible, and which occasioned combustion by its disengagement, there being left after its evolution either an acid or an earth. In the above-named work he maintains that the processes of obtaining sulphur from sulphuric acid, and of procuring the metals from their earths or *calces*, are analogous, and consist alike in the addition of his phlogiston. Thus sulphur, according to the phlogistic theory—which held undivided sway in chemistry until the time of Lavoisier, who substituted for it the theory of oxygenation (1775–81), and was maintained by a few chemists, especially Priestley, till the beginning of the present century—was composed of sulphuric acid and phlogiston; lead, of the *calx* of lead and phlogiston, etc. In consequence of the general adoption of the phlogistic theory, when Priestley, in 1774, discovered oxygen, and when Scheele a little later discovered chlorine, the names these chemists gave to their discoveries were *dephlogisticated air* and *dephlogisticated marine acid*. According to modern views, mainly based on Lavoisier's experiments, the *addition* of oxygen takes place in the formation of acids and of earths, instead of the *subtraction* of phlogiston. The question whether the process was, in fact, one of addition or subtraction, was finally decided by the balance, an instrument to which chemistry owes most of its marvelous progress during the last three-quarters of a century.

PHLOX, a genus of plants of the natural order *polemoniaceæ*, distinguished by a prismatic calyx, salver-shaped corolla, and unequal filaments. The species are pretty numerous, mostly perennial plants with simple leaves, and mostly natives of North America. A number of species are common in our flower-gardens. This has of late become a favorite genus with florists, and many very fine varieties have been produced.

PHO'BEROS, a genus of trees of the natural order *flacourtiaceæ* or *bixaceæ*, of which one species, *P. mundtii*, the *klipdoorn* of the Dutch colonists of South Africa, although only 20 to 30 ft. high, attains a diameter of 3 ft. or more, and is very useful for the purposes of wagon-makers and house-carpenters, the wood being hard and fine-grained; another South African species, *P. ecklonii*, the *roodpeer* of the colonists, has a hard, heavy, and fine-grained wood, used by cabinet-makers, mill-wrights, etc.

PHOCÆA, a t. in Asia Minor, s.w. of Cyma, founded by colonists from Phocis, and afterward included in the Ionian confederacy. It was one of the principal Asiatic ports, but lost much of its importance under the Persians, who captured it in the time of Cyrus. A portion of the inhabitants then sailed for Corsica, where they founded a colony called Alalia. The Phocæans were the founders of Massilia and other ports on the Mediterranean.

PHOCÆ'NA. See PORPOISE.

PHO'CAS, emperor of Constantinople (602–10), was a Cappadocian by birth, and was for some time groom to Priscus, one of the celebrated generals of the emperor Mauricius (q.v.). His brutal courage gained him a great reputation among the soldiers, and though only a centurion at the time of the revolt against Mauricius, he was elevated to the throne by the soldiers. To secure himself, he caused Mauricius to be murdered, along with his five sons and his principal adherents; and then, by a treaty disgraceful to the empire, got rid of the Avars. But his troubles were just commencing, for Khusru II. (q.v.), shah of Persia, hearing of the death of his friend and benefactor, Mauricius, an event which freed him from the obligation of amity with the eastern empire, took up arms to revenge his friend's murder, and to recover for Persia all the territories previously under her sway. The war was fiercely carried on for 24 years, during the first 18 of which the Persian army was uniformly successful, and the Byzantines were almost completely driven out of Asia. See KHUSRU II. and HERACLIUS. Phocas remained in the capital to overawe his turbulent subjects, conscious of his unfitness to command the army; and abandoned himself to his animal appetites, tyrannizing over the people without the least regard to justice, and putting to death whomsoever he thought dangerous, among others Narses, the celebrated general in the former Persian war. Constantina, the widow of Mauricius, excited against the tyrant two formidable insurrections, the latter in 607, but both were speedily quelled, and the ex-empress with her daughters were beheaded on the same spot where her husband and sons had been slain. Her principal adherents, some of whom were among the highest officers of state, suffered death under the most horrible tortures. These cruelties and the successes of the Persians had well nigh ruined Phocas's power and influence. But he gave the *coup de grâce* to it himself

by insulting his favorite and son-in-law, Crispus, who had remonstrated with him on his conduct. Crispus revenged himself by forming a conspiracy against him, along with Heraclius, exarch of Africa, the result of which was the overthrow of the tyrant, who was taken prisoner (Oct. 3, 610). After being insulted and tortured he was beheaded, and his body dragged through the streets by the mob.

PHO'CIDÆ. See SEAL.

PHO'CION (Gr. *Phokiôn*), an Athenian general of noble character, was b. about the end of the 5th century B.C. Clinton, in his *Fasti Hellenici*, gives the date 402 B.C. He was of humble origin, but appears to have enjoyed a superior education, and to have studied under Plato, Xenocrates, and perhaps Diogenes also, from the last of whom he may have acquired his habit of indulging in caustic sarcasm. Phocion first attracted notice in the great sea-fight at Naxos (376), where he commanded a division of the Athenian fleet, and materially helped to secure the victory for his countrymen. Strange to say, however, we scarcely hear of him again for more than 20 years; but in 351, along with Evagoras, he undertook the conquest of Cyprus for the Persian monarch, Artaxerxes III. (Ochus), and was completely successful. About the same time, but the exact date is uncertain, he led an Athenian expedition into the island of Eubœa, where Philip of Macedon was intriguing, and inflicted a severe defeat on that powerful sovereign at Tamynæ. In 341 he was again successful in crushing the Macedonian party in Eubœa, and in restoring the ascendency of Athens. Two years before this he had achieved a similar result at Megara; and in 340, when sent to the aid of the Byzantines against Philip, he acted with so much prudence and tact, and inspired the citizens with so much zeal and courage, that Philip was forced to abandon the siege, and even to evacuate the Chersonesus, while Phocion captured several of his ships and coast-garrisons, besides making havoc of a good deal of the Macedonian territory. Nevertheless, with just appreciation of the real weakness of Greece proper, and of the strength of Macedon, he advocated, even in the midst of his triumphs, pacific views and the establishment of better relations with the enemy. His advice was not taken; but the fatal battle of Chæronea, only two years afterward, in which the independence of the Greek republics was lost forever, proved its soundness. The murder of Philip, in 336, occasioned the greatest exultation, and Demosthenes even proposed a public sacrifice of thanksgiving and the establishment of religious honors to the memory of the assassin, but Phocion resisted and prevented so monstrous a proposal. Henceforth his career is chiefly political. We see him struggling at Athens to repress what appeared to him the reckless desire for war on the part of the fanatical patriots, on account of which he was regarded as a traitor, but his personal honor is above suspicion. After the death of Alexander in 323, the aged Phocion endeavored, but in vain, to hinder the Athenians from going to war with Antipater. The battle of Cranon, next year, which prostrated his countrymen, again evinced the wisdom of his counsels; but though very unhandsomely treated by the Athenians, he used all his influence with the conqueror (who like Alexander had a profound respect for him) to mitigate their hardships. After the death of Antipater, Phocion was involved in the intrigues of Cassander, the rival of Polysperchon, and was forced to flee to Phocis, where Polysperchon delivered him up to the Athenians. He was condemned by "a mixed mob of disfranchised citizens, foreigners, and slaves" to drink hemlock (317 B.C.). His body, flung unburied over the borders of the state, was carried by some of his friends to Eleusis and burned there. The Athenians soon began to raise monuments to his memory. His life has been written by Plutarch and Cornelius Nepos.

PHO'CIS (Gr. *Phôkis*), a province of Greece proper or Hellas, bounded on the w. by the Ozolian Lokri, on the n. by Doris, on the e. by the Opuntian Lokri, and on the s. by the gulf of Corinth. It was about 792 sq.m. in extent. The greater part of the country is occupied by the famous mountain-range of Parnassus (q.v.). The principal river is the Cephissus. According to tradition, the most ancient inhabitants were the Leleges, Pelasgians, and Thracians, from the gradual mixture of whom the Phocians were believed to have arisen. These were finally united into a free federal state, which derives its chief historical importance from possessing the famous oracle of Delphi (q.v.). During the Peloponnesian war the Phocians were close allies of the Athenians. In the time of Philip of Macedon they were involved in a ten years' war, on account of their opposition to a degree of the Amphictyonic council concerning the use of a piece of land belonging to the temple of Delphi. This war, commonly known as the sacred or Phocian war, ended disastrously for the Phocians.

PHŒBE-BIRD. See PEWEE.

PHŒ'BUS (i.e., the bright or radiant), a title, and subsequently a name of Apollo. It had reference both to the youthful beauty of the god and to the radiance of the sun, when latterly Apollo became identified with Helios, the sun-god.

PHŒNICIA. See PHENICIA.

PHŒNICOP'TERUS. See FLAMINGO.

PHŒNIX, bird. See PHENIX.

PHŒNIX. See DATE PALM and PALMS.

PHŒNIXVILLE, a borough of Schuylkill township, Chester co., Penn., at the junction of French creek and the Schuylkill river, 23 m. n.w. of Philadelphia and 30 m. s.e. of Reading ; a station on the Philadelphia and Reading, and the Pickering Valley railroads ; pop. in 1890, 8514. The Phœnix iron works are said to be the largest in the United States. There are newspapers, banks, a seminary, and many churches and schools, and manufactures of copper, cotton, and wood.

PHO'LAS, a genus of lamellibranchiate mollusks, of the family *pholadidæ*. This family, to which the ship-worm (*teredo navalis*) also belongs, has the shell gaping at both ends, thin, white, very hard, sometimes with accessory valves; the two principal valves beset with calcareous inequalities, connected by fine transverse parallel ridges, forming a kind of rasp, used by the animal for boring a hole in rock, wood, or other substance, in which it lives. The animal itself is either club-shaped (as in *pholas*) or worm-shaped (as in *teredo*), with large long siphons, often united almost to the end, and a short foot. Several species are natives of the British coasts. They are popularly called *piddocks*. They are used for bait, and also for food. How the pholades or pittocks excavate the holes in which they live, sometimes in clay or mud, but often in chalk, and even in much harder rocks, has been the subject of much dispute. An excavating instrument armed with siliceous particles, has been ascribed to the animal, but no such instrument exists. The shell is studded with projections, in regular rows, giving it the character of a rasp or file; and the pholas fixing itself firmly by its foot, which acts as a sucker, and working itself from side to side, makes use of the rasping power of its shell to enlarge its hole as it has need, so that the hole is always very exactly accommodated to the size of the occupant.

PHONAUTOGRAPH. See Sound, Recording of,

PHONET'IC WRITING is the representation of speech by means of symbols for the elementary sounds of language. All alphabetic writing is essentially phonetic. The invention of letters was the invention of phonetic writing, as distinguished from the older pictorial, or ideographic, writing. From a variety of causes, however, no language has ever been perfectly represented by its spelling, and with the lapse of time the divergence has gone on increasing, since the spoken words are constantly undergoing change, while the spelling tends to remain fixed. In English, more especially, this divergence has been allowed to proceed to such an extreme that it is admitted on all hands to be a serious evil, and in recent times various schemes have been projected to remedy it. It is to these schemes of radically reformed spelling that the name of phonetic writing is now more especially applied; and what follows, represents the views and arguments of the promoters of the movement, and sketches its history.

The earliest attempts at alphabetic writing were as strictly phonetic as the limited scheme of symbols allowed, or as the limited aim of writers required. The alphabets were confined almost exclusively to consonants; and the analysis of speech on which they were based was of course confined to the languages for which the alphabets were designed. When any old alphabet, therefore, came to be adopted for a new language or dialect, it would be found deficient in the means of writing any sounds which were not used in the language for which the alphabet was originally intended. Unless, then, new symbols were added for the new sounds, these latter must have been represented by conventional combinations of letters; and at this point the writing would cease to be perfectly phonetic.

The Sanskrit language furnishes the most convincing proof of the original phonetic character of alphabetic writing; for not only were words written exactly as they were sounded, but every change which a word underwent in utterance was consistently indicated by a change in the writing. Notwithstanding this fact, there is no language in which the etymological and grammatical relations of words are more clearly exhibited or easily traced than in Sanskrit. Our own language illustrates the same principle. No difficulty is experienced in discovering the relation between *loaf* and *loaves*, *wife* and *wives*, notwithstanding the change of *f* into *v* in the plural; nor would any difficulty be created though the *s* also were changed, as it is in sound, and the words written as they are pronounced—lōvz ,wīvz.

The English language embraces in its dialects almost all the elementary sounds of all languages; and the Latin alphabet, which was adopted for its writing, was so insufficient in the number of its characters, that many new letters would have been required to adopt it for the representation of Anglo-Saxon and other words. But, in place of being extended, the alphabet was reverentially accepted with all its imperfections; its deficiencies were supplemented by the use of servile or silent letters, and by various orthographical expedients; and thus our writing came to be irregular, difficult, and fluctuating. The great inconvenience, however, of representing by the same character the sounds of U and V led to the introduction of the former as a new letter for the vowel sound, and to the limitation of the latter character to the consonant sound; and the further ambiguity arising from the want of an appropriate sign for the sound of W led to the invention of that symbol, which, being formed by joining together two of the old V characters, was thence called "double V"—pronounced, according to the old sound of V, "double U." The phonetic principle was fully recognized in these changes, and they furnish precedent for further changes, when a necessity for them shall be sufficiently felt and acknowledged.

There can be no doubt that phonetic writing would greatly facilitate the acquisition of the power of reading, and consequently of the education of children and illiterate adults, as well as tend to the reduction of dialects to one common standard, and further the diffusion of our language in foreign countries. To learn to read from perfectly phonetic characters would be merely to learn the alphabet, and to spell would be merely to analyze pronunciation. A child at school might be made a fluent reader in a few weeks. All uncertainty of pronunciation would vanish at the sight of a word, and dictionaries of pronunciation would be superfluous.

Of all the languages which employ the Latin alphabet, the English is the worst represented; in some measure because of the rich variety of its phonic elements, but chiefly because, of all the nations which have adopted Latin letters, the English have done least to make their writing phonetic. Every attempt to correct the anomalies of our orthography has roused a host of prejudices, against which the efforts of private individuals have been powerless. The difference between phoneticians and their opponents seems to be a fundamental difference as to what really constitutes a word. The former, maintaining the *sound* to be the true word, would discard all associations dependent on letters, in order to represent the exact sound in the simplest manner; the latter, clinging to the literal associations of orthography, argue as if the verbal cluster of *letters* in reality constituted the word. The dispute is thus, in effect, between letters and sounds; which are the signs—which the thing signified?

In phonetic writing, the eye would no doubt confound such words as *know* and *no*, *see* and *sea*, *sighs* and *size*, when written separately, as in a vocabulary; but it cannot be supposed that such words would present more ambiguity in contextual usage than they now do in utterance, subject to the same confusion to the ear. At present we have, in fact, two languages—one purely phonic, addressed to the ear; and the other, in some degree etymological or historical, addressed to the eye. In this respect, we are in a similar position to the Chinese, with their classical ideographic language of literature, and their multitudinous vernacular dialects. In order to establish the assertion, that the phonic word (the sound) written phonetically in a sentence would be less intelligible to the eye than the written word in its present form, it is incumbent on the opponents of phoneticism to show that the simple phonic word is now less intelligible when pronounced in a sentence, than its written symbol is when read in a sentence.

The principal objection urged against phonetic writing is, that it would obscure the etymological history now discoverable in the orthography of a word. The best answer to this objection is that the traces of etymology, preserved in the present spelling, are so imperfect and inconsistent as to be of little value compared with the embarrassments they occasion in other respects.

The first requisite for the construction of a phonetic alphabet is an exact knowledge of elementary sounds, that every element may be provided with its appropriate symbol, and that no more symbols may be introduced than there are distinct elementary sounds. The latter consideration would be of importance only in connection with a general alphabet available for all languages. An alphabet for any individual language might contain symbols for compound sounds, with no other disadvantage than that of adding to the number of symbols. It would not, for instance, be of any consequence, so far as phonetic writing is concerned, whether the word *sacks* were represented by the letters *saks*, *sacs*, or *sax*, so that the symbols used were invariably appropriated to the same sounds. Orthoepists and phoneticians are not agreed as to what elements compose many of our compound sounds, such as those heard in the words *chair*, *queen*, *tune*, *I*, *out*, etc. Any attempt, therefore, at representing compounds analytically would be premature, until the analysis of the compounds had been settled. This analysis would be absolutely necessary for a general alphabet, but not so for an alphabet for any single language. Phonetic writing, then, should be separately considered, as a means of representing the elementary sounds of all languages, and as a method of symbolizing the pronunciation of any one language only. We shall now show the nature of the attempts that have been made for the phonetic writing of English.

Dr. Franklin, in 1768, proposed a phonetic alphabet for English, in which new symbols were introduced for the vowels heard in the words *on* and *up*, and the four consonants heard in the words *she*, *they*, and *thing*. Many other schemes have been from time to time proposed; but the only alphabets which have been practically applied on a large scale are those of Dr. Comstock in America, and Messrs. Ellis and Pitman in England. The object of experimenters in this department has generally been to make use of existing letters as far as possible, and only to supplement deficiencies by new forms. The common alphabet has been made to furnish almost a sufficient number of characters by the inversion of some of its letters—thus, ʌ, ʎ, ɐ, ɔ, e, ʒ, ɥ, etc., as in the "anti-absurd" alphabet of Maj. Beniowski; but the best scheme of phonotypes that has yet been introduced was the joint production of Mr. Isaac Pitman, the inventor of the first system of phonetic shorthand writing, and Mr. A. J. Ellis, B.A. of Cambridge, a most accomplished mathematician and linguist. This alphabet was completed in 1847; and the experiment of its introduction was carried out with great diligence and perseverance by its promoters, until an army of philanthropic assistants became enlisted in all parts of Great Britain and America. Primers and school-books were issued, and tested on juvenile and adult classes; many works of standard literature, and even the entire Bible,

were translated into the new spelling; magazines were published, and ultimately a newspaper, printed in the phonetic character, was started by the enterprising orthographic reformers. In this scheme of phonotypes, dipthongal and articulate compounds were not analyzed, and the letters of the ordinary alphabet were retained in their most common signification, 17 new characters being introduced for unrepresented or ambiguously written sounds. The forms of these were, in most cases, happily suggestive of the displaced orthography, and the general aspect of the writing bore such a resemblance to common typography, that any good reader of the latter could decipher the new printing with ease, after a very brief study of the alphabet. The ordinary vowel letters (A, E, I, O, U) were pronounced as in the words *am, ell, ill, on, up;* the consonants C and G were sounded as in *came* and *game;* the letters K, Q, X were rejected as superfluous, and all the other letters of the common alphabet were retained, with their established sounds. Comparing this scheme of letters with the tabulated elementary sounds of English, we find that it represents all the vowels, except the nice varieties heard in the words *air, ore, err, ask;* and that all the consonants are accurately represented except *wh.* The latter element is written by letters sounding *hoo,* so that the words *where* and *whoe'er* are made identical to the eye; and the sentence, "I saw the man *whet* the knife," is written, "I saw the man *who ate* the knife."

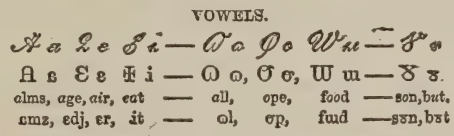
Notwithstanding these imperfections, this alphabet was found to work well among those who were disposed for a reform. The phonetic method was proved to be remarkably simple and easy in comparison with the ordinary system; the time occupied in making fluent readers was greatly reduced; and readers of phonetic printing experienced but little difficulty in the transition to reading from common orthography.

The advantages claimed for the system were chiefly: rapidity of learning to read, certainty of pronunciation, and increased facility in common reading, after the power of phonetic reading had been acquired. The chief disadvantages alleged against the system were: accustoming the eye to a false orthography, and teaching what had to be in great part unlearned after it was acquired. Whether the objectors were right or wrong, they were overpoweringly numerous, and the system failed to do more than prove that phonetic spelling greatly simplifies the acquisition of the power of reading.

The original phonotypic alphabet, described above, has been for some years discarded in the printing issued from the "phonetic institution" (Bath), and a more analytic alphabet has been adopted, in which *eleven,* instead of seventeen, new forms are introduced. The latest edition of this alphabet gives the ordinary vowel letters A, E, I, O for the sounds in the words *am, ell, ill, on,* and the letter U for the sound in *pull;* K is restored, and C rejected; J is used as in French; and the elementary sound of *wh* is still unacknowledged. The 11 new characters represent the consonants in the words *she, oath, they,* and (s)*ing;* and the vowels in the words *ale, eel, alms, old, all, pool, up.*

The following are the forms of the new letters as printed and written, with a passage exhibiting their appearance in composition:

VOWELS.



Ⱥ ⱥ	Ⱦ ⱦ	Ⱨ ⱨ	—	Ⱪ Ⱪ	Ⱪ ⱪ	Ⱬ ⱬ	—	Ɑ Ɑ
Ⱥ ⱥ	Ⱦ ⱦ	Ⱨ ⱨ	—	Ⱪ Ⱪ,	Ⱪ ⱪ,	Ⱬ ⱬ	—	Ɑ Ɑ.
alms,	*age,*	*air,*	*eat*	—	*all,*	*ope,*	*food*	— *son, but.*
ɛmz,	ɛdj,	ɛr,	it	—	ɷl,	ɷp,	fɯd	— sɤn, bɤt

DIPHTHONGS.				CONSONANTS.			
ɛi,	ei,	ɷi,	ou.	Ⱥ ɕ,	Ⱥ ɓ,	Ⱥ ɗ,	Ⱥ ŋ.
ai	*ei*	*ɷi*	*ou*	*ɕ ɕ*	*ɓ ɓ*	*ɗ ɗ*	*ŋ ŋ*
ay,	*by,*	*boy,*	*now.*	*she,*	*thin,*	*then,*	*sing.*
ɛi,	bei,	bɷi,	nou.	ɕi,	ɓin,	ɗen,	siŋ.

The double letter *u,* as in *unit, unite, duty, value,* is written thus: "yɯnit, yuneit, diɯti, valiu." When *ai, ɷi,* make a *dissyllabic* diphthong, the second letter is marked with a diæresis; thus, *solfaïŋ, sɷïŋ.*

"'Tiz ɗe meind ɗat mɛks ɗe bodi ritɕ;
and az ɗe sɤn brɛks ɓrɯ ɗe darkest kloudz,
sɷ onor 'pɹireɓ in ɗe mɹinest habit.
ʕ Hwot! ʕ iz ɗe djɛ mɷr preɕɤs ɗan ɗe lark,
bikɷz hiz feɗerz ar mɷr biɯtiful;
or ʕ iz ɗe ader beter ɗan ɗe ɹil,
bikɷz hiz pɛnted skin kontents ɗe ei.
ɷ nɷ, gud Kɛt; neiɗer art ɗou ɗe wɤrs
for dis pɯr fɤrnitiur and mɹin ɛrɛ."

This phonetic alphabet consists of 34 letters, viz., the 23 useful letters of the common alphabet (*c, q,* and *x* being rejected), and 11 new ones below, *J* is used for the French j

(zh), or *g* in "edge," or *s* in "vision;" hence *dj* represents *J* in *John*, and *dg* in *edge*. *Tç* (*t sh*) represents *ch* in *chess*, and *tch* in *catch*. *Y* and *w* are consonants; *wh* being replaced by *hw*. The vowels *a, e, i, o, u* have invariably the short sounds heard in *pat, pet, pit, pot, put*. All the other old letters have their usual signification. The italic letters in the words in the third line denote the SOUNDS of the letters.

The reduction in the number of letters from that in the Ellis and Pitman alphabet is obtained chiefly at the expense of the phonetic *principle*, in the attempt to analyze diphthongs in writing, before their correct phonic analysis has been ascertained and settled. A method has been proposed by Mr. Bell, in which the advantages of phoneticism might be secured, so far as simplifying the acquisition of reading is concerned, without alphabetic change. Thus the orthography and sound are shown together when the words *loaf, debt, wife, wreath, straight*, etc., are printed lo^{e}f, de^{b}t, wif^{e}, wre^{a}th, stra^{i}g^{h}t, etc.

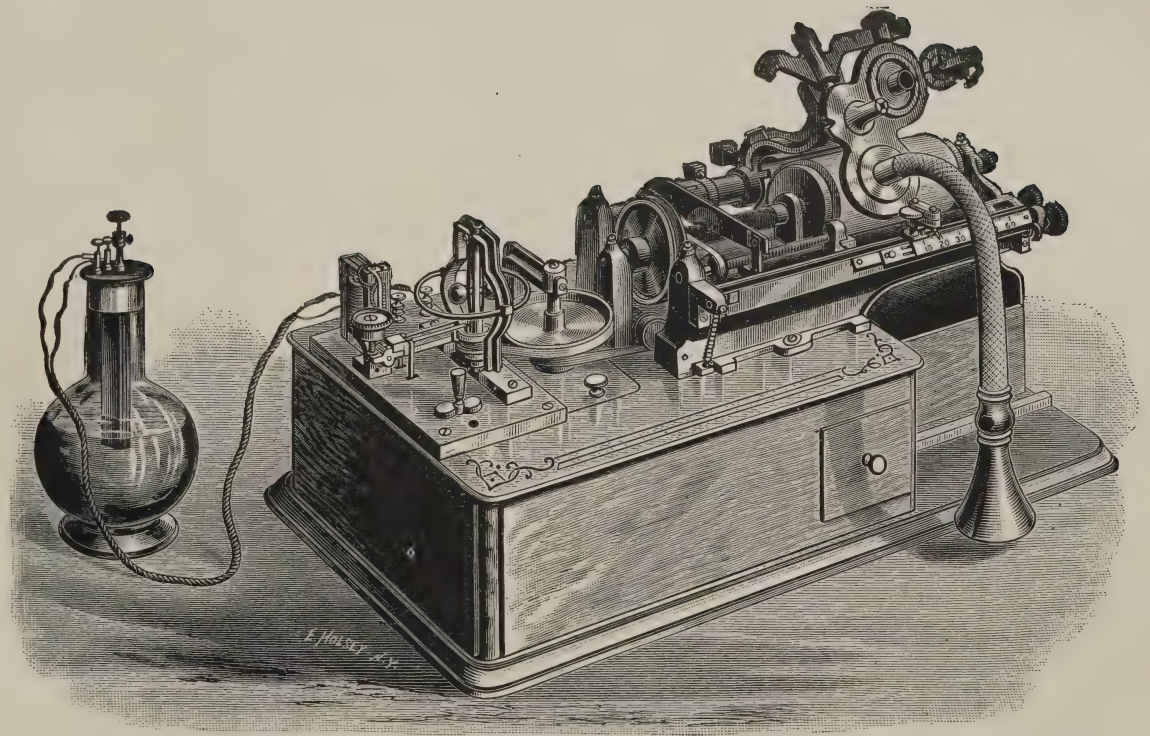
The chief difficulty in the construction of a universal alphabet has arisen from the want of a complete classification of elementary sounds; another difficulty has been created by an adherence to the inadequate letters of the Roman alphabet. Symbols must be devised which would indicate to the eye all the organic relations discoverable by the ear between the various elements, and which would be free from the associations that would attach to adopted letters familiar to the eye with other meanings. This principle has been carried out on the system of *visible speech* (q.v.) by Mr. Melville Bell. For phonetic short-hand writing, see SHORT-HAND. See also SPELLING REFORM.

PHONOGRAPH. So far as we have authentic record, the first mechanical device for the registering and subsequent reproduction of speech or other sound was the invention of one Leon Scott, and made in 1857. This consisted simply of an ellipsoidal barrel, which was the sound receiver, and which was open at one end and closed at the other. From the closed end projected a small tube, across which was stretched a flexible membrane. To the center of this membrane, by means of sealing wax, was affixed a bristle, which acted as a stylus, and which shared the vibrations of the membrane. In front of the membrane was placed a horizontal cylinder, about which was wrapped a sheet of paper, covered with a thin layer of lamp-black. Against this prepared cylinder the bristle rested lightly. Any sound vibrations entering the ellipsoid were transmitted through the membrane to the stylus, which, when the cylinder was made to revolve, and to slowly advance in revolving, described on the lamp-black surface a zigzag line which was thus practically a phonographic score of whatever noise had been produced.

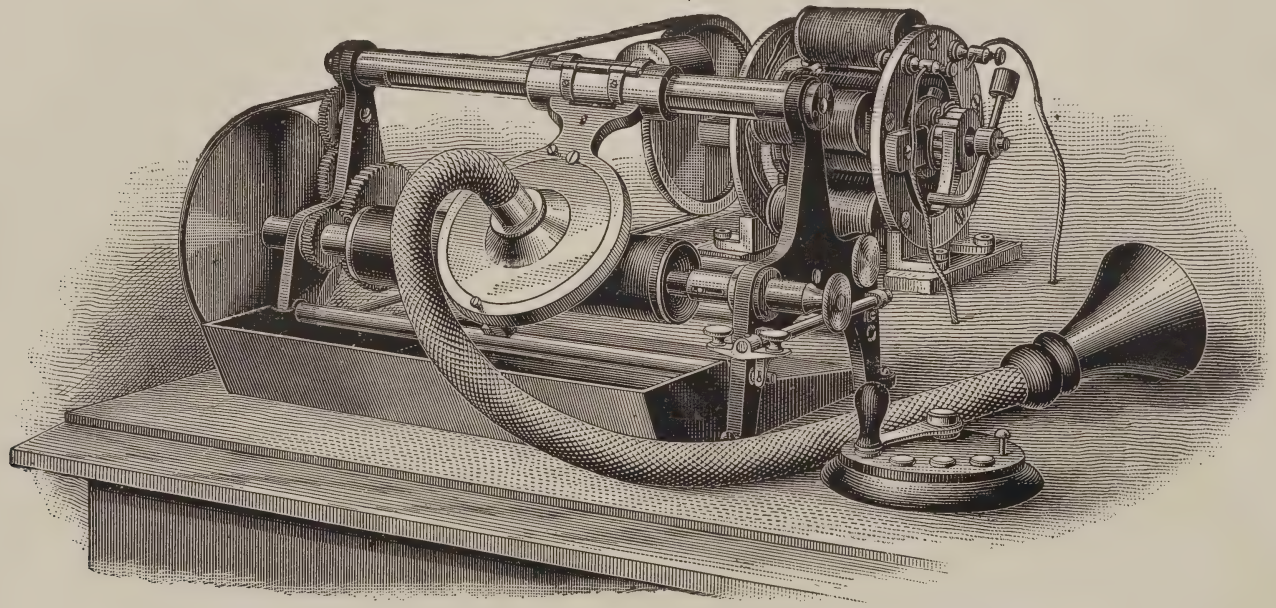
The invention of Leon Scott embodies the essential principles on which recording and reproducing instruments of the present day are based. If now we substitute a receiving funnel for the ellipsoid, a more rigid or metal stylus for the bristle, and a tin-foil covered cylinder for the lamp-black one, we have the phonograph of Thomas A. Edison, which created such a sensation at the time of its invention in 1877; with this essential difference, however, that the sound vibrations were now *indented* instead of being traced. By reversing the machine—that is, causing a blunt stylus to travel over the indentations made, the original sound was reproduced. Great expectations were entertained, commercially and otherwise, of this invention at the time; but it was found that after a few repetitions the record became effaced from the tin-foil, and the invention proved to be scarcely more than an interesting toy.

During the year 1888 Mr. Thomas A. Edison placed upon the market a phonograph which was (see illustration) a far more elaborate machine than any of its predecessors. The tin-foil now gives place to a wax cylinder, which, as shown in the illustration, is slipped over and held on a mandrel. In the illustration two disks are shown: one for recording and the other for reproducing; and either is quickly brought into use. In operating, the wax cylinder is made to revolve. In talking into the funnel, the malleable glass diaphragm, with a cutting stylus on its under surface, is made to vibrate, and a register of the sound is thus cut vertically into the wax, the cutting stylus advancing horizontally as the cylinder revolves. In reproducing, the other diaphragm, which is made of bolting silk thinly coated with shellac, is used; the needle or stylus being attached to its under center. This stylus follows the track cut out by the recording stylus. Its motion causes the diaphragm to vibrate, and to thus reproduce the original sound. The machine gets its power from a small electric-motor. It must not be presumed that the sound thus reproduced is equal in volume to the original. In fact, many, on hearing it for the first time, are disappointed in this respect. By means of tubes inserted in the ears and connected with the reproducer the sounds may, however, be clearly understood, and if a funnel be attached to the reproducer, and the speed of the machine properly increased, the sounds may be given out with sufficient loudness to be heard by all in a room. In using a cylinder that already contains a phonographic record, a sharp knife precedes the cutting stylus, thus removing the previous record. A record once made can be reproduced several thousand times without perceptible impairment of its quality, and a record made on one machine can be reproduced on another, thus admitting of the cylinder's being used for mailing, as in ordinary correspondence. Although the phonograph and graphophone are used to a considerable extent for entertainment purposes they have failed to take the place of stenographers, as was at first expected, to any great extent.

In 1891 Mr. Edison made a novel combination of the phonograph with the photographic camera. An arrangement of the latter in a new way to do a new work, the inventor calls the KINETOGRAPH, which does for the eye what the phonograph does for the ear. The kinetograph, or "motion-recorder," is a camera containing a roll of gel-



THE EDISON PHONOGRAPH, SHOWING GOVERNOR, AND BATTERY CONNECTION.



THE PHONOGRAPH-GRAPHOPHONE, SHOWING MOTOR ATTACHMENT.

atine film which is unrolled from one spindle to another and, in being unrolled, is made to pass before the lens of the camera. The shutters of the camera are so arranged as to be worked by a shaft attached to the cylinder of the phonograph which is used in combination with the Kinetograph. The mechanism of the camera allows forty-six perfect photographs to be taken in one second. These photographs, enlarged and reproduced upon a screen with the same rapidity, give to the eye the picture of actual motion, while the phonograph gives to the ear the simultaneous utterances of the person or persons whose figures are on the screen. It will thus be possible for the possessor of the Kinetograph not merely to hear an opera, but to see its action transpiring before his eyes.

PHONOGRAPH-GRAPHOPHONE, THE. This machine, the invention of Mr. Charles S. Tainter and Mr. Chichester A. Bell, while much more simple in mechanism, is based upon exactly the same set of principles as Mr. Edison's phonograph. It can be run either by a motor or a treadle. The cylinder, instead of being of wax only, is made of a spirally wound strip of paper, and has a wax surface on which the phonographic record is made, and, instead of being slipped over a mandrel, is held between chucks at either end. No cylinder, however, can receive more than one tracing. Below the cylinder is arranged a pan for receiving the fine shreds of wax which the recording stylus throws off. The number of grooves to the inch is 160. The groove is only three one-thousandths of an inch wide, and less in depth. In this machine the recording and reproducing apparatuses are separate and removable. In the machine as shown, the recording diaphragm is affixed.

In both the inventions of Edison and Tainter, there is no limit to the speed with which sounds can be recorded, nor to the number and variety of sounds. They will accurately record and reproduce a solo, a quartet, or the music of a whole orchestra; the difficulty being the purely mechanical one of concentrating the sounds upon the diaphragm. Even the tone of a voice is reproduced with considerable fidelity. By increasing the speed of the cylinder, the pitch is raised, while by lessening it the pitch is lowered.

PHONOMA'NIA. See Homicidal Mania.

PHOS'GENE GAS, known also as Oxychloride of Carbon or Chlorocarbonic Acid, is represented by the formula $COCl_2$. At ordinary temperatures it is a colorless, suffocating gas, which is formed by exposing equal measures of carbonic oxide and chlorine to the direct action of the sun, when they combine and become condensed into half their volume. It does not possess any acid characters, but water decomposes it into carbonic and hydrochloric acids, as is shown by the equation $COCl_2 + H_2O = CO_2 + 2HCl$. This gas is of great interest in relation to the artificial production of urea (q.v.). It is now made and used on a large scale for the production of several beautiful dye-stuffs.

PHOS'PHATES (in physiology). The following phosphates* play an active part in the chemistry of the animal body.

Phosphate of soda, which may occur under any one of the three forms, Na_3PO_4, or Na_2HPO_4, or NaH_2PO_4. All these salts are soluble in water; and the first two have an alkaline reaction, while the third is acid. By exposure of the second of these salts, Na_2HPO_4, to a red heat, it is converted into what is termed *pyrophosphate of soda,* $Na_4P_2O_7$, in which the phosphoric acid is obviously no longer tribasic, but tetrabasic; and by similarly treating the third of these salts, NaH_2PO_4, we convert it into the so-called *metaphosphate of soda,* $NaPO_3$, in which the phosphoric acid is monobasic. It is in consequence of these changes under the action of heat, that the terms *pyrophosphoric* and *metaphosphoric* have been used as synonyms for *tetrabasic* and *monobasic phosphoric acids.* Phosphate of soda, in one or other of the above forms, occurs as a constituent of all the animal fluids and soft tissues of the body, but is especially abundant in the urine and the bile. There are reasons for believing that it is the second and third of these salts which occur as constituents of the animal body, although the first may possibly sometimes be found. Pyrophosphate and metaphosphate of soda are often found in the ashes of animal fluids or tissues after the process of incineration, but they merely result from the action of heat on the two other salts. The following remarks on the derivation, elimination, and physiological importance of the phosphate of soda, are equally applicable to the corresponding salts of potash, which are always associated with them. The phosphates of the alkalies, which occur in the animal body, obviously owe their origin, either directly or indirectly, to the food; viz., directly, by being ingested as phosphates of the alkalies; or indirectly (within the system), by the action of phosphate of lime on salts of the alkalies. The elimination of these salts from the system is necessary, because they are being constantly supplied by the food; and this process is effected mainly by the kidneys and the intestinal canal. In the carnivorous animals, whose blood is much richer in phosphates than that of herbivora (the ash of the blood of the dog, for example, contains from 12 to 14 per cent. of phosphoric acid, while that of the ox or sheep does not contain more than from 4 to 6), these salts are carried off by the urine; but in consequence of the formation of free acids as products of the disintegration of the tissues, a portion of the base is abstracted from the originally alkaline phosphates, and a corresponding portion of phosphoric acid is liberated. The originally alkaline salt is thus rendered neutral or even acid; and the occurrence of

* The means of distinguishing between the salts of monobasic, tribasic, and tetrabasic phosphoric acid, are given in the article Phosphorus.

the acid phosphate of soda, NaH_2PO_4, in the urine is thus explained. In the herbivorous animals, on the other hand, the urine contains no phosphates, the whole of the phosphoric acid taken in their food being eliminated by the intestinal canal in the form of the insoluble phosphates of lime and magnesia. Although the general distribution of the phosphates of the alkalies in the nutrient fluids (there is forty per cent. of them in the ash of the blood-cells; 28.4 per cent. of phosphoric acid and 23.5 of potash in the ash of cow's milk; and about 70 per cent. of phosphoric acid in the ash of the yelk of egg) is in itself an indication of their importance, the exact nature of their functions is not completely understood. Liebig has specially drawn attention to the peculiar grouping of the acid and alkaline fluids of the animal body. The permanence of this grouping is chiefly maintained, especially in herbivorous animals, by the conversion, within the body, of alkaline and neutral phosphates into acid phosphates by the means already described. Moreover, all tissue-forming substances (the protein bodies) are so closely connected with phosphates, that they remain associated during the solution and subsequent re-precipitation of these substances; and the ash of developed tissues (such as muscle, lung, liver, etc.) always affords evidence that acid phosphates existed in the recent tissue; and, further, no exudation from the blood-vessels can undergo transformation into cells and fibers, or, in other words, become organized, unless, in addition to other condititions, phosphates are also present. Another very convincing proof of the share taken by the phosphates in the formation and functions of the tissue, is the fact that, although herbivorous animals take up a very small quantity of phosphates in their food, and although their blood is very poor in these salts, their tissues contain as large a proportion of phosphates as the corresponding parts of carnivora. Lastly, the fact, that one equivalent of the alkaline phosphate of soda, Na_2HPO_4, possesses the property of absorbing as much carbonic acid as two equivalents of carbonate of soda, leads us to the belief, that the power of attracting carbonic acid, which the serum of the blood possesses, is due at least as much to the phosphate as to the carbonate of soda, and that, consequently, phosphate of soda plays an important part in the respiratory process.

Phosphate of lime occurs in the organism in two forms, viz., as the normal calcium phosphate, $Ca_3(PO_4)_2$, and the monohydrogen calcium phosphate, also called acid phosphate, $CaHPO_4$. The normal phosphate occurs in all the solids and fluids of the body, but is most abundant in the bones, in which it amounts to about 57 per cent.; and in the enamel of the teeth, in which it ranges from 80 to 90 per cent. It may at first sight appear inexplicable how a salt so perfectly insoluble in water as normal phosphate of lime, can be held in solution in the animal fluids. In some fluids, as the blood, it is probably, in part at least, combined with albumen, with which it forms a soluble compound; while in other fluids, as the urine, it is held in solution by a free acid or by certain salts (as, for example, chloride of sodium), whose watery solutions are more or less able to dissolve it. If any proof is wanted of the functions of this salt in relation to the bones, it is afforded by the well-known experiment of Chossat, who showed that when too small a quantity of it is taken with the food, the bones lose more or less of their hardness and firmness, and fractures do not readily unite. Phosphate of lime, like the phosphates of the alkalies, is indispensable to cell-formation; and as a good illustration of this fact, it may be mentioned that in the mantle of the mollusks (where new cells for the formation of shell abound) this salt is far more abundant than in any other part of the body. Although by far the greater quantity of the phosphate of lime found in the body has doubtless pre-existed in the food, yet it is unquestionable, that a part of it is formed within the organism by the action of carbonate of lime on the phosphoric acid that is formed during the disintegration of the phosphorus-containing tissues, such as the brain, for example. In man and carnivorous animals, a certain portion of the phosphate of lime is eliminated by the kidneys, and the rest is carried off in the excrements; while in herbivorous animals the whole is carried off in the excrements. The acid phosphate of lime is occasionally found in the urine of man and carnivorous animals, but is of no practical importance. For a notice of the amount of earthy phosphates daily eliminated by the kidneys, the reader is referred to the article URINE.

Normal Phosphate of Magnesia, $Mg_3(PO_4)_2$, is analogous, both in its chemical and physiological relations, to the corresponding salt of lime, with which it is always associated. The abundance of this salt in the seeds of the cereals, and in the other ordinary articles of vegetable diet, sufficiently explains its presence in the system. A far less amount of this salt than of the corresponding lime-salt seems to be required by the organism, as is shown by the relative quantities in which they occur in bone (57 of the former to 1.3 of the latter), and as is further indicated by the fact that, relatively, far more of this than of the lime-salt escapes intestinal absorption, and appears in the excrements.

The only phosphates remaining to be noticed are the *phosphate of ammonia and magnesia*, or, as it is sometimes termed, the triple phosphate, $Mg(NH_4)PO_4 + 6Aq$, which occurs in beautiful prismatic crystals in alkaline urine, and, indeed, in any specimen of urine that is beginning to putrefy, and the *phosphate of soda and ammonia*, which is occasionally found as a crystalline sediment in putrid urine.

PHOSPHAT'IC DIATH'ESIS, in medicine, designates the condition in which there is a tendency in the urine to deposit *white gravel*. As the deposit of lithates (see LITHIC ACID DIATHESIS) depends upon an excessive acidity of the urine, so that of the phosphates is

determined by the opposite condition—namely, by deficient acidity, or by positive alkalescense. Alkalescence of the urine may occur from two distinct causes—viz. (1) from the presence of the carbonate of a fixed alkali (potash, or soda), or of alkaline phosphate of soda (see PHOSPHATES in physiology); or (2) from the presence of the carbonate of the volatile alkali, ammonia, which is due to the decomposition of urea. This decomposition is due to the fermenting action of the mucus of the bladder on the urea, and is explained

Urea. Water. Carbonate of Ammonia.

by the equation—$\overbrace{CO(NH_2)_2}+\overbrace{2H_2O}=\overbrace{(NH_4)_2CO_3}$.

The white gravel which is deposited in the second of these conditions—viz., when the urine contains carbonate of ammonia, is composed of minute shining prismatic crystals of the triple phosphate of ammonia and magnesia, whose formula is given in the article PHOSPHATES. This salt is formed as follows: Healthy urine contains phosphate of magnesia in a state of solution. If, however, the urine become alkaline from the decomposition of the urea, a portion of the ammonia combines with the phosphate of magnesia, and forms the triple salt which is insoluble in the urine, which has now become alkaline. With this triple phosphate, there is almost always an admixture of phosphate of lime $Ca_3(PO_4)_2$ in the form of an amorphous precipitate. The tendency to deposit the mixed phosphates (triple phosphate and amorphous phosphate of lime) is especially observed in cases of disease or injury of the spinal cord, and in disease of the bladder, particularly in chronic inflammation of its mucous coat. Upon allowing urine of this kind, which is usually pale in color, to stand for some time, an iridescent film or pellicle generally forms upon its surface, which, when examined under the microscope, is found to consist mainly of the salts we have described. Such urine speedily becomes putrid, and evolves a strong ammoniacal odor.

The above is by far the most common form of the phosphatic deposits, but, as has been already stated, the urine may become alkaline from the presence of the carbonate of potash or soda; and then, no ammonia being present, in place of the triple salt, there is a deposition of amorphous phosphate of lime, or in rare cases, of a crystalline stellar phosphate, whose composition, according to Dr. Bence Jones, is represented by $CaHPO_4$ (*Journ. of Chem. Soc.*, vol. 15). In these cases the urine is alkaline, pale, copious, slightly turbid, of low specific gravity, and of a peculiar odor. This urine makes reddened litmus paper *permanently* blue; while ammoniacal urine causes only a temporary change in the color of the same test-paper. As the urine cools, and sometimes even in the bladder, the white sand is deposited, occasionally giving the last portion of the excreted urine a milky appearance. During perfect health, the urine often becomes temporarily alkaline during the act of digestion (when the gastric juice is especially acid); but as a general rule, the tendency to alkalescence from a fixed alkali, and therefore to phosphatic deposits, is associated with general debility. These deposits occur for the most part in sallow, languid, unhealthy-looking persons, whose vital energies have been depressed by mental anxiety, by insufficient food, or by sexual excesses.

In both forms of alkaline urine, and therefore of phosphatic deposits, a generous diet and tonics, such as bark, wine, and the mineral acids (given before meals), are of great service; and opium is usually of great value, if judiciously administered. Small doses of benzoic acid, twice or thrice a day, with the view of restoring the acidity to the urine, and the occasional washing-out of the bladder with tepid injections, have been also found serviceable in the ammoniacal form of the disease.

PHOSPHOR-BRONZE, gun metal with the addition of a small proportion of phosphorus. Gun metal contains about 10 parts of copper to one of tin. The addition of a little over one-half per cent. of phosphorus increases the fluidity when melted of the metal and increases its elasticity and strength on cooling. Trials at Berlin were made with over 400,000 pulls on a bar of phosphor-bronze with a strain of ten tons to the sq. in., without rupture; but an ordinary bar of bronze broke with less than 10 tons strain. In regard to elasticity the following results have been obtained in recent Austrian experiments. Phosphor-bronze, 54.915; Krupp's cast steel as used for guns, 14.450; ordnance bronze, 5.562. The addition of phosphorus also confers upon copper or bronze protection against sea water.

PHOSPHORES'CENCE. Strictly speaking, the term is applied to the phenomenon, exhibited by certain bodies, of remaining luminous in the dark for some time after being exposed to a strong light. In this sense, it is strictly analogous to, perhaps we should say, identical with, the heating of bodies by exposure to light or radiant heat. They absorb part of the energy of the vibrations which fall on them; it becomes motion of their particles; and is again radiated from them as light or heat. Certain preparations, such as Canton's phosphorus (q.v.), indurated limestone, etc., possess this true phosphorescence in a very high degree. With the great majority of phosphorescent bodies, however, the duration of the phenomenon is very short, rarely more than a small fraction of a second. Becquerel, who has recently studied this phenomenon with great care, has invented a very ingenious instrument for the purpose, called a *phosphoroscope*. The body to be tried is placed in a small drum, which has an opening at each end. In this drum there revolve two disks, mounted on the same axle, and pierced symmetrically

with the same number of holes. They are so adjusted that when a hole in one disk is opposite to the hole in the corresponding end of the drum, the second disk closes the hole at its end of the drum, and *vice versâ*. Light is admitted by one of the holes in the drum, so as to fall on the object, and it is examined through the other hole. It is obvious that when the disks are made to revolve, the object is alternately exposed to light, and presented to the eye. By a train of multiplying wheels, these alternations may be made to succeed each other as rapidly as the observer pleases, and thus the object is presented in the dark to his eye as soon after its exposure to light as may be desired. Almost all bodies are found to be phosphorescent; for instance, some kinds of pink rubies, when exposed to sunshine in this apparatus, appear to glow like live coals in the dark. The phenomenon is, in fact, precisely that which was observed by Brewster and Herschel in quinine and certain crystals of fluor-spar, and thence called *fluorescence*. Stokes was the first to give the true explanation of these facts, and he showed it to depend upon the change of refrangibility (i.e., color) which light suffers on being absorbed and then radiated by the fluorescent substance. The green coloring-matter of leaves, a decoction of the bark of the horse-chestnut, and the common *canary* glass (colored with oxide of uranium), are bodies which exhibit this phenomenon very well. Perhaps the most striking method of studying the phenomenon is to receive in a darkened room the solar spectrum (q.v.) on a sheet of white paper; and to pass over the colored spaces a brush dipped in a solution of sulphate of quinine with citric acid. No change is produced on the less refrangible rays, but in the blue and indigo spaces a strange change of color is at once apparent where the liquid has been spread. This appears more strongly in the violet, and vividly in the spaces beyond the violet, where rays fall which excite no luminous sensation in the eye. By this experiment, the visible length of the spectrum may easily be doubled. By using the electric light, which is peculiarly rich in these highly refrangible rays, a prism of quartz, which allows them to pass very freely, and various fluorescent substances, Stokes has obtained spectra six or eight times as long as those otherwise visible. The characteristic of all these rays is that they are *less* refrangible than those from which they are produced. The entire phenomenon is identical in principle with Leslie's photometer, in which light was measured when changed into heat by absorption, in the colored glass of which one of the bulbs of his differential thermometer was formed.

Ordinary phosphorus (from which the phenomenon took its name) becomes luminous in the dark by slight friction; whence the common trick of drawing self-luminous figures on doors and walls with a stick of phosphorus, or an ordinary lucifer-match. A similar appearance is presented by putrescent animal matter, such as decaying fish, etc.; but these are effects of slow combustion, or chemical combination, and are not properly classed among the phenomena of phosphorescence. See Luminosity of Organic Beings.

PHOSPHOR'OSCOPE, a philosophical apparatus invented by Becquerel for measuring the duration of phosphorescence in different bodies. See Phosphorescence.

PHOS'PHORUS (symb. P., equiv. 31; sp. gr. 1.826) is one of the metalloids, or non-metallic elements, although, in its combining relation, it is more closely connected with the metals arsenic and antimony than with any of the members of the sulphur-group, in which it is commonly placed.

This substance affords an excellent example of allotropy; that is to say, it may be made to occur under different forms presenting different properties. See Allotropy.

Ordinary phosphorus and the red variety are the only important forms. We shall speak of them as phosphorus and red phosphorus respectively.

Phosphorus at ordinary temperatures is an almost colorless or faintly yellow solid substance, having the glistening appearance and the consistence of wax, and evolving a disagreeable alliaceous odor, which, however, is probably due to the action of the oxygen of the air upon it. It fuses at 111.2° F. (44° C.) into a colorless fluid; if the air be excluded, boils at 554° F. (290° C.), and is converted into a colorless vapor of sp. gr. 4.58. If it be heated to about 140° F. (60° C.) in the air, it catches fire, burns with a brilliant white flame, and is converted into phosphoric acid; and it is so inflammable that it will catch fire at ordinary temperatures by mere friction. As the burns which it occasions are often severe and dangerous, great caution is required in handling it; and in consequence of the readiness with which it catches fire, and of its tendency to oxidize when exposed to the air at a temperature higher than 32° F. (0° C.), it is always kept in water, in which it is insoluble. It is slightly soluble in ether and in the fixed and essential oils, but dissolves freely in carbon disulphide; and by allowing its solution in one of these fluids to fall upon filtering paper, the finely divided phosphorus absorbs oxygen so rapidly as spontaneously to catch fire as soon as the solvent has evaporated. One of the most characteristic properties of phosphorus is that it shines in the dark, probably from the slow combustion which it undergoes; and hence its name from the Greek words *phōs*, light, and *phŏros*, bearing. Its power of forming ozone is noticed in the article on that substance. Taken internally, phosphorus is a very powerful irritant poison; and it is the active ingredient of some of the preparations employed for the destruction of vermin. Its fumes give rise to a peculiar form of necrosis of the jaw, which is very common

amongst the makers of lucifer-matches, and is not followed, as in ordinary necrosis, by a formation of new bone.

Red phosphorus differs from the ordinary variety in several important points. It occurs as a deep red amorphous powder, which is perfectly devoid of odor, may be heated to 500° F. (260° C.) without fusing, has a specific gravity of 2.10, does not shine in the dark, nor take fire when rubbed, undergoes no change on exposure to the air at ordinary temperatures, and is in all respects far less inflammable. Moreover, it is insoluble in bisulphide of carbon and the other fluids in which ordinary phosphorus dissolves, and is not poisonous. Red phosphorus is used in certain brands of lucifer-matches, which ignite only when rubbed on a specially prepared surface. When red phosphorus is heated in an atmosphere of carbonic acid to a temperature of 500° F. (260° C.) it is converted, without loss of weight, into ordinary phosphorus.

Phosphorus is never met with in nature in an uncombined state, but it occurs in small proportion as phosphate of lime in the primitive and volcanic rocks (as was first shown by Fownes in 1844), by the gradual decay of which it passes into the soil; it is also found abundantly in the minerals known as *apatite* and *phosphorite*, and in the brown rounded pebbles which abound in the Norfolk Crag, and which, under the name of *coprolites*, are much employed, when crushed, for manure. From the soil, it is extracted by plants, which accumulate it (especially in the seeds of the cereals) in quantity sufficient for the wants of the animals which they supply with food. In the animal system, phosphate of lime forms 57 per cent of the bones; phosphates of the alkalies especially of soda, occur freely in the animal fluids; and in fibrine, albumen, and nervous matter, phosphorus is universally present, although we do not clearly know in what form of combination it occurs.

Phosphorus was originally discovered in 1669 by Brandt, a Hamburg chemist, who obtained it from urine. Gahn and Scheele were, however, the first to discover its presence in bone, and to employ that material for its preparation. The following are the leading steps of the method now usually employed in obtaining it on the large scale. Bones are burned to whiteness, and powdered; and this bone-ash is then mixed with sulphuric acid in such quantity as partially to decompose the calcium phosphate occurring in the ash $Ca_3(PO_4)_2$ into insoluble calcium sulphate, and a soluble acid calcium phosphate, whose composition is represented by the formula $CaH_4(PO_4)_2$. The solution of the acid calcium phosphate is evaporated to dryness and the residue ignited. Water is thus driven off and calcium metaphosphate $Ca(PO_3)_2$ formed. This is then mixed with charcoal, and submitted to distillation in an earthen retort exposed to a red heat. Phosphorus rises in vapor, and is conveyed, by means of a bent tube, into water, in which it condenses in yellow drops. In the retort the charcoal takes oxygen from a part of the calcium metaphosphate, forming carbonic oxide and setting the phosphorus free, and leaving behind normal calcium phosphate, $Ca_3(PO_4)_2$. Thus only a fraction of the phosphorus is evolved. Sometimes sand is added to the mixture in the retort; in that case all the phosphorus is obtained, the lime remaining behind as calcium silicate, $CaSiO_3$. The phosphorus drops are collected, melted under water, filtered through leather and cast into *sticks*, in which form it is commonly met with.

Phosphorus forms with oxygen two oxides—viz., *phosphorous trioxide*, P_2O_3 (which is always produced in small quantity when phosphorus is burned in air, but is of no practical importance), and *phosphorous pentoxide*, P_2O_5. There are three acids of phosphorus—viz., hypophosphorous acid, H_3PO_2, phosphorous acid, H_3PO_3, and phosphoric acid, H_3PO_4. Of these compounds, phosphorous pentoxide and phosphoric acid are by far the most important, and we shall therefore consider them first in order.

Phosphorous pentoxide, or *phosphoric anhydride*, as it is usually termed at the present day, is represented by the formula P_2O_5, and is obtained by burning phosphorus in a jar of perfectly dry atmospheric air or oxygen, when it is deposited in snow-white flakes at the bottom and on the sides of the jar, from whence it must be removed by means of a platinum spatula as quickly as possible, in consquence of its attracting moisture from the atmosphere, and placed in a perfectly dry flask. When dropped into water, it combines with it, and dissolves, evolving a considerable amount of heat, and emitting a hissing sound, as when red-hot iron and water come together. In consequence of its strong affinity for water, it is very useful as a desiccating agent.

There are three hydrates of phosphorous pentoxide, each of which possesses the properties of a distinct acid—viz., a monohydrate, $H_2O \cdot P_2O_5$, a dihydrate, $2(H_2O) \cdot P_2O_5$, and a trihydrate, $3(H_2O) \cdot P_2O_5$. These hydrates retain their characteristic properties when dissolved in water, and combine with one, two, or three equivalents of bases to form salts, according to the hydrate employed. In the salts formed by the first hydrate, the one equivalent of water is replaced by one equivalent of base; in those formed by the second hydrate, both equivalents of water may be replaced by two of base, or one equivalent of water alone may be replaced, while the other remains in the salt as basic water; and in those formed by the third hydrate, all three equivalents of water, or two, or only one, may be replaced by base, so that this acid forms three sets of salts. Hence phosphoric acid is what is termed a *polybasic acid* (q.v.). The following scheme may elucidate this remark: If M, M′, M″, are any three monad metals, whose oxides act as bases, the monohydrate H_2O,P_2O_5 forms the salt M_2O,P_2O_5, and is monobasic; the dihydrate $2(H_2O),P_2O_5$ forms the salts M_2O,M'_2O,P_2O_5 and M_2O,H_2O,P_2O , and is bibasic; the trihydrate $3(H_2O),P_2O_5$

forms the salts M_2O,M'_2C,M''_2O,P_2O_5, M_2O,M'_2O,H_2O,P_2O_5, and $M_2O,2(H_2O)$, P_2O_5, and is tribasic.

The occurrence of phosphoric acid (in a state of combination) in the three kingdoms of nature has been already noticed in our remarks on phosphorus. The discovery of the acid was made in 1740 by Marggraf; the discovery of its true chemical nature is, however, due to Lavoisier; and that of its various modifications and its polybasicity, to the investigations of the illustrious Graham.

Phosphorous acid is the trihydrate of phosphorous trioxide, P_2O_3, thus: $3H_2O \cdot P_2O_3$ or H_3PO_3. *Hypophosphorous acid*, H_3PO_2, occurs as a very acid, colorless, uncrystallizable syrup. There is no corresponding oxide.

Phosphorus combines with hydrogen in three proportions to form gaseous hydrogen phosphide, PH_3; liquid hydrogen phosphide, P_2H_4; and solid hydrogen phosphide, P_4H_2. Of these, the first alone requires notice in these pages. There are various processes for obtaining the gas; one of the simplest being by boiling fragments of phosphorus in a concentrated solution of hydrated potash, in which case, hypophosphite of potash is formed, while phosphureted hydrogen gas is evolved. The reaction is explained by the equation $3KOH + P_4 + 3H_2O = 3KH_2PO_2 + PH_3$. The gas thus evolved is colorless, possesses a characteristic fetid odor, and has the remarkable property of taking fire spontaneously in atmospheric air or in oxygen gas, and of resolving itself into anhydrous phosphoric acid, and water—a phenomenon of which prof. Miller has given the following graphic description: "If allowed to escape into the air in bubbles each bubble as it breaks produces a beautiful white wreath of phosphoric acid, composed of a number of ringlets revolving in vertical planes around the axis of the wreath itself as it ascends; thus tracing before the eyes, with admirable distinctness, the rapid gyratory movements communicated to the superincumbent air by the bursting of a bubble upon the surface of a still sheet of water. If the bubbles be allowed to rise into a jar of oxygen, a brilliant flash of light, attended with a slight concussion, accompanies the bursting of each bubble." There is reason to believe that *perfectly pure* phosphureted hydrogen gas does not possess the power of igniting spontaneously, and that the self-lighting gas always contains a minute quantity of the vapor of the liquid phosphide, P_2H_4. The luminous phenomenon known as *will-o'-the-wisp* has been referred to the natural evolution of the gas; there is, however, no scientific evidence in favor of this hypothesis.

Various compounds of phosphorus with sulphur, chlorine, iodine, bromine, etc., have been formed and investigated; but none of them are of any practical importance.

The medicinal uses of *phosphorus* and *phosphoric acid* have still to be considered. Phosphorus, dissolved in ether or oil, was formerly prescribed in very minute doses as a stimulant to the nervous system in certain conditions. It is, however, now rarely employed in medicine, at all events, in this country, in consequence of its poisonous properties. Several cases are on record in which children have been killed by sucking the phosphoric ends of lucifer-matches; and Christison relates an instance in which a grain and a half of phosphorus proved fatal.

The symptoms induced by this poison are those of acute inflammation of the stomach and bowels, and the only treatment that can be recommended is the administration of large quantities of mild demulcent fluids, such as milk and thin arrowroot, so as, if possible, to envelop the phosphorus, and exclude it from the action of the air in the intestinal canal; and of magnesia, with the view of neutralizing any phosporous and phosphoric acids that may be formed.

Dilute phosphoric acid is included in the regular pharmacopœia, but is not very much employed. It may be prescribed in much the same cases as those in which sulphuric and nitric acids are employed, and is less likely to disturb the digestive functions, if employed for a long period, than the other mineral acids. The late Dr. Paris used to recommend it, when properly diluted, as the best acidulated drink for assuaging the thirst in diabetes. It may be prescribed in half-dram doses.

PHO'TIUS, Patriarch of Constantinople in one of the most critical periods of the struggle of that see with the great patriarchate of the west for supremacy in the entire church, was a member of a patrician family of Constantinople, and was b. in the early part of the 9th century. From youth he was distinguished by his abilities and learning; and having served in various important public offices, and especially on a diplomatic mission to Assyria (or more probably Persia), he secured the favor of the emperor Michael, with whom Photius's brother was connected by marriage, and of all-powerful Cæsar and his favorite Bardas. The patriarch Ignatius having incurred the displeasure of Bardas and of the emperor, a weak and profligate man, whose vices Ignatius tried in vain to correct, it was resolved to deprive him of the patriarchal dignity; and the attempt to induce him to resign having failed, he was deposed with much indignity, imprisoned, and sent into exile. Photius, although a layman, and hitherto engaged in secular pursuits, was appointed in his stead, hurried in a few successive days through all the stages of sacred orders, and finally installed as patriarch. A council of bishops, under the influence of the court (858), declared in favor of the deposition of Ignatius, and confirmed the election of Photius, and the latter communicated his election to the pope, Nicholas I., in a letter which carefully suppressed all these irregularities, and represented that he had reluctantly undertaken the office. Meanwhile, however, Ignatius had privately written to Rome, and the pope sent two legates to inquire and report on the facts. A new council

was assembled (859), by which Ignatius was deposed. Nicholas insisted on a new hearing. A new cause of dispute arose respecting the jurisdiction of the see of Constantinople, and the council, called at Rome, in 862, annulled the acts of the former one and reinstated Ignatius. Photius, retaining possession with the emperor's help, assembled a council at Constantinople in 867; a controversy of doctrine and discipline between the eastern and western churches resulted, and the council, after excommunicating Nicholas and his abettors, withdrew from the communion of the see of Rome. In 869 Michael was put to death by Basil the Macedonian, when Photius was banished to Cyprus and Ignatius reinstated, and at a council, known as the eighth general council, assembled at Constantinople, Photius was convicted of fraud and usurpation, and the intercommunion of the churches restored. Photius, however, finally obtained his recall, and succeeded Ignatius on the death of the latter, Pope John VIII. acquiescing, an act for which he was nicknamed *Joanna*, this *sobriquet* possibly originating the story of Pope Joan (q.v.). Photius in 879 assembled a new council at Constantinople, again condemned the western church and revived the doctrinal controversy. The separation of the churches, however, was not completed till the time of Michael Cerularius. See Greek Church. In 886 Photius was exiled to Armenia by Leo, the son and successor of Basilius, and died about 891. The Greeks defend his memory, but the westerns accuse him of craft, violence, and perjury. His genius, at all events, was rare, and his literary judgment profound. His chief remains are (1.) *Myriobiblon*, called also *Bibliotheca*, a summary review of 279 works which Photius had read, many of which are now lost. (2.) A *Lexicon*. (3.) The *Nomocanon*, which is a collection of the acts and decrees of the councils and ecclesiastical laws of the emperors. (4.) Several minor theological treatises. (5.) A collection of letters, many of them extremely interesting and elegant. See Hergenröther's monograph on P. (1869).

PHOTOGRAPHY and **PHOTOGRAPHIC PROCESSES** (Gr. *phos*, light, and *grapho*, I write. As the terms "positive" and "negative" are constantly used in photography, it will be well to explain them at the outset. In their ordinary meaning, the one is the reverse of the other as regards light and shade. But with respect to a photographic picture on glass, its being a positive or a negative really depends upon whether it is viewed by reflected or transmitted light. Daguerreotypes are all positives, because they are taken on metal plates, and can only be seen by reflected light. Our picture on glass is also positive when viewed in the same way, but glass being transparent, it is negative when looked at by transmitted light—that is, when held between the eye and the light. Those portions of the image which are light in the positive way are dark in the negative way. This will be quite plain to any one who looks at such a picture by both lights, laying it on black cloth for the positive view. For convenience, it has become the practice to call a photographic picture a negative if it is intended to print positive pictures from it. In a negative the parts intended to print black on the paper are completely transparent, the whites are completely opaque, and the gradations between are the intermediate shades. Usually, the negative is on glass and the positives are prints on paper, but many negatives are on paper made translucent by means of wax, or they may be on gelatine. A photographer generally manipulates his picture differently, according as he intends it for a negative or a positive, so that a photograph on glass can scarcely be at the same time a pleasing positive or a good negative; but this is a mere technical detail.

History.—It is usual to regard the observation by the alchemists of the 16th c. that *luna cornea*, or horn silver, is blackened on exposure to light, as the first important step in the history of photography. This property of chloride of silver, and also the darkening of nitrate of silver by light in the presence of organic matter, constitute the leading facts on which the science of photography is based. In 1777, the famous Swedish chemist Scheele found, by experiment, that horn silver was blackened quickest by the violet ray of the solar spectrum, thus proving that the rays of light are not all alike chemically active. A quarter of a century later, Ritter of Jena demonstrated the existence of chemically active non-visible rays beyond the violet ray of the spectrum.

The honor of having been the first to produce pictures by the action of light on a sensitive surface is now very generally conceded to Thomas Wedgwood, an account of whose researches was published in 1802 in the *Journal of the Royal Institution*, under the title: "An Account of a Method of copying Paintings upon Glass, and of making Profiles by the Agency of Light upon Nitrate of Silver; with Observations by H. Davy." The misfortune was, that no attempts made either by Wedgwood or Davy to prevent the uncolored portions from being acted on by light (or, as we now say, to *fix* the picture) were successful.

M. Niepce of Chalon-on-the-Saone was the first to enjoy the satisfaction of producing *permanent* pictures by the influence of solar radiations. This was accomplished in 1814, and the name chosen to designate his process was heliography. It consisted in coating a piece of plated silver or glass with asphaltum (bitumen). The plate so prepared was then exposed in the camera obscura for a length of time, varying from four to six hours! Wherever the light acted, it rendered the asphaltum insoluble in certain essential oils. Hence, on subsequent treatment with one of these solvents, the shadows of the image dissolved away, and the lights were represented by the insoluble asphaltum remaining on the plate.

Daguerre appears to have begun in 1824 the experiments which eventually led to the

discovery of the daguerreotype process. On Daguerre's learning that Niepce was working in the same direction as himself, the two formed a partnership in 1829. The discovery of the daguerreotype was announced in January 1839, but the details of the process were not made public till August of the same year. It consists in exposing a metal plate covered with iodide of silver for twenty minutes in a photographic camera, the plate being afterwards transferred to a dark room, and exposed to the vapor of mercury, which develops the latent image, it being afterwards fixed (see DAGUERREOTYPE). Although this process has become almost obsolete, it was really the first which was of any practical value. While Daguerre's processes for the purpose were imperfect, he still succeeded in fixing his pictures; although it was sir John Herschel who announced the great suitability of the hyposulphites for dissolving the haloid salts of silver.

Mr. Henry Fox Talbot read a paper to the Royal society on "photogenic drawings" on Jan. 31, 1839, just six months previous to the publication of Daguerre's process. He produced these in this way: Writing-paper was steeped in a solution of common salt, and dried. It was then dipped in a solution of nitrate of silver, which is changed by the action of the common salt into the chloride of silver, some of the nitrate, however, remaining unaltered. Paper so treated is extremely sensitive to light, so that when a fern leaf, for example, is placed close down upon it between two plates of glass, the paper blackens except where it is covered, and thus a reversed picture of the leaf on a black ground is obtained. This *negative* was then placed over another sheet of paper, prepared in the same way, and the light allowed to act through it. Another picture of the leaf was thus produced, but this time with its lights and shades, the same as in nature, in other words, a *positive* print was got. A large number of these positives was obtained from one negative. Talbot fixed the print with bromide of potassium.

The Calotype process was patented by Mr. Fox Talbot in 1841. It is sometimes called the Talbotype process. He had now so far perfected a photographic process, that the steps in it remain practically the same to the present day, although the materials used to some extent differ. Talbot produced his negative by preparing paper on the surface with iodide of silver, subsequently washing it over with a mixture of nitrate of silver, with gallic and acetic acids, and then exposing it in the camera to the object he wished to copy. The invisible image or picture thus obtained was developed by aceto-nitrate of silver and gallic acid, and fixed with bromide of potassium. The paper negative was then waxed and used for the production of many positives in the way described above.

Photographic Apparatus.—The most important piece of apparatus used by the photographer is the camera obscura (q.v.), generally called simply a camera. On the front portion, a suitable glass lens is fixed, which throws the image on a ground glass screen placed at the back, to enable it to be sharply focused. A thin flat box with a shutter, together called a "slide," contains the sensitized plate. When the picture is focused, the screen is withdrawn and the "slide" is inserted in its place; the shutter is then drawn out, and the sensitized plate, which exactly occupies the place of the glass screen, being now exposed, receives the picture. In a brief time, which nowadays varies from a fraction of one to several seconds in a good light, the shutter is closed, and the slide returned to a dark room, where the plate is taken out and developed. If a dark tent is not used, it is necessary, when working in the field, to take as many dry sensitive plates put up into double slides, as one intends to use in one day, unless a "changing box" be adopted.

Lenses.—The quality as well as the kind of lens used is of great importance. For an explanation of the different forms and properties, see LENS. A lens which is well adapted for taking portraits or other objects in a room is not suitable for taking landscapes. In the one case, it is only necessary for the lens to give a sharp definition of a figure a few feet off, and to do its work rapidly, while what is required in the other is, that distant objects, lying in far different planes, should be clearly defined. To effect this, the curves of the lenses, as well as their distance apart in the compound arrangement, must be different in each case. For ordinary landscape work, indeed, a single lens of the meniscus form may be used, as the distortion it gives is not much noticed, but a properly constructed double lens is better. When architectural subjects are to be photographed, a combination of lenses which correct all distortion must be adopted, otherwise vertical lines converge, and therefore appear out of the perpendicular. What is called a "wide-angle" doublet lens is used for taking a view of a building in a narrow street, where the operator cannot retire far enough to take in the whole pile with an ordinary lens. A doublet lens of the ordinary kind for landscape work embraces an angle of about 50°, while a wide-angle doublet embraces about 90°—that is, these lenses cover circles whose respective diameters subtend angles of 50° and 90° from their optical centers.

A diaphragm or stop is used along with the lens. This is a thin disc of metal perforated with holes of different sizes, the largest of which is much less in diameter than the lens itself, opposite the center of which any of the perforations can be placed. Since the central rays and the marginal rays have different points of intersection, the object would be wanting in definition if the whole lens were used.

Wet Collodion Process.—Collodion (q.v.) is the name given to a solution of gun-cotton in a mixture of ether and alcohol. When this is spread over a glass plate, it gradually dries into a transparent film. It was first introduced for photographic purposes in 1851 by Mr. Scott Archer, and has been of important service. For fully a quarter of a cen-

tury, the wet collodion process was almost exclusively practiced by photographers. Dry collodion processes have also been in use, although on a greatly more limited scale. All of these are now largely superseded by a method in which gelatine takes the place of collodion. These are the stages in the wet collodion process: (1.) A glass plate made perfectly clean is coated with collodion, to which the bromide of cadmium, and either iodide of potassium or iodide of ammonium, have been added. (2.) The collodionized plate is "sensitized" by immersion in a bath of nitrate of silver, containing 35 grains to every ounce of distilled water. (3.) Production of latent image by exposing the sensitized plate in the camera obscura after the object has been focused. (4.) Development of latent into visible image by flooding the plate in a solution of sulphate of iron (ferrous sulphate), or of pyrogallic acid, to either of which some alcohol and acetic acid are added. (5.) Fixing of the permanent image by immersion of the plate in some solvent of the unactinized silver salts—that is, of those parts of the sensitive surface upon which the light has not acted. For negatives from which paper positives are to be printed, the solvent is a solution of hyposulphite of soda (sodium hyposulphite). For positives—that is, where the original photograph on glass is to be kept as a positive, the solvent is cyanide of potassium.

Dry-Plate Processes.—A few only of the earlier dry-plate processes will be named, since, except for experimental purposes, they have all been superseded by the gelatino-bromide process. Several advantages arise, especially for field-work, from using dry sensitive plates. With the wet process, the operator, away from his studio, must carry a dark tent, collodion, a silver bath, and developing agents; but these impedimenta are not required with dry plates, which, however, have (or had) some disadvantages. Dry-plate processes are of two principal kinds: (1.) Those in which the collodion is applied to the glass plate, and afterwards sensitized in the silver bath, as in the wet way, but with a preservative such as albumen "flowed" over the surface, and the plate allowed to dry. (2.) Emulsion processes, in which the sensitive silver salt is held in suspension in the collodion or gelatine. A good emulsion is made by adding some soluble bromide, such as bromide of cadmium, to the collodion, and afterwards an alcoholic solution of nitrate of silver. The glass plates are simply coated with this emulsion, and set aside to dry, when they are ready for use.

The earliest form of the gelatino-bromide process appears to be due to Dr. Maddox, who published the details of a workable emulsion of this nature in 1873 by Mr. Kennett, and again in 1878 by Mr. Charles Bennett. It was found that if the emulsion was kept at a temperature of 90° F. for some days, or boiled for half an hour, the sensitiveness of the plate coated by it was so greatly increased, that a view which could only be taken formerly in 30 seconds, could now be taken in one. A very sensitive gelatine emulsion can also be formed by using ammonia along with the bromide of silver. Dry plates produced by some form of the gelatino-bromide process are now manufactured on a large scale. When properly made, they will keep an indefinite length of time, and they can be developed months after having been exposed. Dry plates can now be made so very sensitive, that in a good light a negative can be taken in $\frac{1}{60}$ part of a second. To obtain a well-defined photograph of an express train in motion, of a swallow poising, or of moving waves or clouds is no longer a matter of difficulty. In the taking of these photographs, what is called an "instantaneous shutter" is required for the lens of the camera—that is, a cover which, by some means such as a spring, will admit light for only a fraction of a second. An important improvement has been made by Mr. Warnerke in doing away with glass for carrying either collodion or gelatine films for negatives, by the use of a paper backing for the sensitive film. Owing to the dry-plate process, it has become possible to photograph successfully landscapes in moonlight, burning fire-works, interiors lighted by gas, etc., the time required for exposure, however, greatly exceeding that allowed for photographs taken by daylight. It has been found that in taking such views the diaphragm may be discarded without consequent loss of clearness.

Photographic Printing: Silver Prints.—As already stated, the production of a silver print on paper depends upon the action of light on chloride of silver. The process is still conducted in essentially the same way as it was originally by Mr. Fox Talbot. A sheet of paper prepared with chloride of silver is exposed to light under a negative, and pressed close to it. In a short time, if the day is bright, a print of the picture is obtained which is fixed by hyposulphite of soda (sodium hyposulphite). The details of the process are briefly as follow: (1.) Suitable paper is coated on the surface with a smooth thin layer of albumen, to which chloride of sodium or of ammonium has been added. (Occasionally, the paper is salted only—that is, impregnated with common salt.) (2.) Silvering of the paper by floating it in a solution of nitrate of silver, 60 grains of this substance being used for every ounce of water. It is afterwards dried. (3.) Exposure to light. The silvered paper is exposed behind the negative in a printing frame with a glass front. The time of exposure varies from ten minutes to two or three hours, but occasionally much longer, according to the brightness of the light and the character of the negative. (4.) Toning. In order to give a pleasing color to the print, it is usual to tone it in a solution of trichloride of gold. (5.) Fixing. The print, when taken from the toning bath, is steeped in a solution of hyposulphite of soda, which removes the undarkened silver salt, and so fixes the image. (6.) Washing. Silver prints require to be washed thoroughly after treatment with the hyposulphite of soda. Imperfectly washed prints soon spot and fade.

Platinotype, or *Platinum Printing Process.*—This kind of printing is a good deal used, as the prints are believed to be permanent, and they are liked by some for their appearance, which differs considerably from that of silver prints. Captain Abney, F.R.S., thus describes the method which gives the best results: "Mr. W. Willis, jr., found that he could obtain an image in platinum black, by means of development, if he sensitized his paper with ferric oxalate, with which was mixed a solution of chloro-platinite of potassium. The action of light on this paper is to reduce the ferric salt to the ferrous state, and when the ferrous salt is in solution, the platinous salt is reduced by it. By floating the exposed paper on a solution of neutral potassium oxalate, which is a solvent of the ferrous oxalate, the platinum salt in contact with it is immediately reduced to the metallic state, and an image is thus built up. To fix the prints, they are immersed in dilute hydrochloric acid, which dissolves away any ferric oxalate there may be, and also gets rid of any oxalate of lime."

The Carbon Printing Processes.—So far back as 1839, Mungo Ponton announced that paper steeped in bichromate of potash and dried, changed its color when exposed to light. It was subsequently discovered that light not only alters the composition of the bichromate, but also oxidizes the size (gelatine) of the paper. Gum, starch, and albumen were also found to become, like gelatine, insoluble when exposed in contact with the bichromate of potash to the action of light. Swan, Woodbury, the Autotype co., and others have utilized this property of gelatine in their processes. In order to see clearly the effect of light on bichromatized gelatine, captain Abney suggests that these three simple experiments be tried. Prepare pieces of paper, by brushing them over with a viscous solution of gelatine, in which is dissolved six per cent. of bichromate of potash, and expose them beneath negatives of line engravings. On immersing one of them in cold water, it will be noticed that the parts protected from the light immediately begin to swell through the absorption of water, whilst those portions unprotected remain unchanged. On immersing another sheet in hot water, the protected gelatine will dissolve away entirely, whilst the rest will remain firmly attached to the surface of the paper. Let a third sheet of the exposed gelatinized paper be brushed over with thin, greasy, lithographic ink, and after soaking in cold water, a wet sponge may be applied to remove all the ink that will come away. It will be found that the non-absorbent parts retain the ink, while the latter reject it.

Swan's Carbon Process.—This is understood to be the first of the permanent printing processes with pigmented gelatine which was commercially successful. In its main features, it resembles what is now called the autotype process. By Swan's method, the paper is coated with a layer or thick film of gelatine which has been previously colored all through its thickness with some permanent pigment such as lampblack. This color is made of carbon in the state of fine soot, hence the name given to the process. The paper so coated is sensitized with ammonium bichromate, and then exposed under a negative till it is supposed to be sufficiently printed. In this case the image is not seen as in a silver print, therefore some indirect plan of telling the proper time of exposure, such as by the use of an actinometer, must be resorted to. The change which takes place in the gelatine film is this: The surface of it next the negative has been rendered insoluble wherever the light has acted, and that to a depth corresponding to the intensity of the light. It results from this, that almost the whole of the surface of the gelatine has been rendered insoluble, but to the greatest depth where the light has acted most strongly. Insoluble portions, however, remain inclosed between its surface and the paper. No picture is visible till these are removed. In this process, the external surface of the exposed gelatine is cemented to a second sheet of paper by means of a solution of india-rubber. Therefore the gelatine layer, with its undeveloped image, is now placed between two sheets of paper; but when it is immersed in hot water, the original backing of paper is easily stripped off, after which the soluble gelatine dissolves away, leaving a picture in pigmented and insoluble gelatine. The image is, however, reversed, so that an object such as a tree seen on the right in the negative now appears on the left in the print. This is obviated by the use of a reversed negative, or by making a double transfer.

Autotype Process.—In most respects, this so closely resembles Swan's process that it is only necessary to note some of the improvements introduced or adopted by the Autotype company, who have acquired a number of patents by others (including Swan's) bearing on their process. The print is produced in bichromatized and pigmented gelatine; but the preparation of the paper, both of that which is to form the temporary and the permanent support for the print, differs in the autotype process, and so also does the way of transferring the print to the paper on which it is to remain. The "pigmented tissue," as the prepared paper used for these prints is called, can be made with a gelatine solution thus composed: Flake gelatine, 1500 grains; brown sugar, 150 grains; honey soap, 150 grains; glycerine, ½ oz.; water, 14 oz. Lampblack or some other pigment is added, with a little warm gelatine and glycerine, to the above. The solution is made hot in a porcelain dish, and the paper floated over it. The Autotype company make the tissue on a large scale and supply it to the public. We have seen that in Swan's process the undeveloped gelatine print adheres to the paper support to which it is transferred by a solution of india-rubber, while by the autotype way, it is transferred to a paper made impervious to water by a coating of insoluble gelatine. An application of pressure with

a flat bar of wood covered with india-rubber, called a squeegee, causes the exposed print to adhere to the impervious paper, and the soluble gelatine is removed by hot water after the original paper backing has been stripped off as described above. This is called the single transfer process. The double transfer process merely differs in the adoption of a second temporary support of opal glass, zinc, or paper coated with a suitable preparation, to get a print which is not reversed.

Woodburytype and Stannotype Processes.—More than thirty years ago, it was found that if a leaf, a bit of lace, or any similar object was placed on a sheet of soft metal, and considerable pressure applied, the impression of leaf or lace was sunk into the metal. From this metal plate prints were taken as from an engraved plate, and the process was called nature printing (q.v.). If we laid an ordinary autotype print instead of a leaf on a flat piece of iron, covering it at the same time with a smooth piece of sheet-lead, and then put them under sufficient pressure, the result would be an imperfect Woodburytype mould in the soft lead. The metal reverse would be faulty, because in this case the gelatine film is too thin to give enough of relief. In order to obtain a proper mould, a layer of sensitized gelatine, considerably thicker than that used for an autotype print, is exposed under a negative. It is developed as in the autotype process, and presents the image in considerable relief. The print is then covered with the lead, and they are pressed together in a hydraulic press, which produces a reverse or mould of the picture in the soft metal without injuring the gelatine relief.

The production of ordinary Woodburytype prints is a purely mechanical operation, the chemical action of light not being called into play. The mould is placed in a printing-press of a peculiar but simple construction, and a viscous solution of pigmented gelatine forms, so to speak, the printing ink. This is poured on the mould, and a thin, hard, strongly-sized paper placed on the top of it. The lid of the press has beneath it a perfectly flat glass plate, which is now brought down on the mould and the lid firmly locked by a catch. The pressure causes all the superfluous gelatine to exude, whilst that in the mould adheres to the paper. In a short time the gelatine sets, when the plate is raised and the print withdrawn. It has now only to be placed in a solution of alum, which renders the gelatine forming the picture insoluble.

The Stannotype (or printing from a surface of tin) has been called a simplified Woodburytype process, and is becoming much used. Mr. Woodbury, to whom it also is due, thus describes it: "A positive is first made from the negative—preferably by the carbon process. From this carbon or other transparency a negative is made also in carbon; but in this case the tissue possesses much more body and much less color, so as to obtain a certain amount of relief. This (gelatine) relief negative is then coated with a thin india-rubber varnish. A piece of tinfoil is laid over it, and the whole passed through a pair of india-rubber rollers—a species of mangle, in fact. We have now a printing mould ready for placing in the press and printing from in gelatinous ink."

Heliotype and Phototype Processes.—Both of these are photo-mechanical methods, in which the gelatine picture is itself used to print from in some form of printing press, instead of being covered with tinfoil as in the Stannotype process. Lithographic ink is used. The film or layer of gelatine forming the printing surface requires to be specially and carefully prepared.

Photographic Enamels on Glass and Porcelain: Powder Process.—By what is called the powder process, prints are produced on paper in plumbago. It has been a good deal used on the continent. A slightly sticky or "tacky" preparation of sugar, gum, glycerine, and potassium bichromate, when exposed to light, loses its tackiness in proportion to the intensity of the light acting on it. A glass plate coated with this preparation will therefore, when exposed under a negative, represent the picture, so to speak, by different degrees of tackiness. In this state, a fine powder sprinkled over it will adhere in proportion to the stickiness of the surface. When the superfluous powder is removed, and the film coated with tough collodion, it can be detached and, if required, put on any support such as paper, but the soluble portion of the gum, etc., is previously removed by washing.

If some powdered metallic oxide, instead of plumbago, is dusted over the undeveloped picture, supposing it to be either on glass or china, and heated in a suitable kiln, it will become vitrified in the same way as an enamel color, when painted on, does.

Cyanotype Printing: Copying of Plans.—This is a simple and useful way of copying geometrical drawings. The drawing is made on tracing cloth or tracing paper in strong, or at least distinct, black lines, and this forms the negative. A sensitizing bath can be made of 1 ounce of citrate of iron and ammonia, 1 ounce of red prussiate of potash (potassium ferricyanide), and 8 ounces of water. An even coating of this is applied to a sheet of paper. When dry, the tracing is placed on the top of the paper, and both are covered with a glass plate to keep them in perfect contact. Ten minutes in a very bright light will suffice for exposure. The print is now washed, when the lines of the drawing will appear white on a blue ground.

Durability of Photographic Prints.—Experience has proved that silver prints, however carefully prepared, cannot be depended upon for permanency. Platinotype prints are believed to be permanent by those best able to judge, but still this is not altogether certain. Autotype, Woodburytype, and other prints in pigmented gelatine are presumably permanent, and of course those obtained by any of the photo-mechanical processes are certainly so when printed, as they usually are, in lithographic or printers' ink.

Photo-Lithography and Zincography.—The only difference between these is, that a lithographic stone is used in the one case and a plate of zinc in the other for the mechanical printing. By what is called the transfer process, this art is now largely practiced, especially for the reproduction of architectural and mechanical drawings and ornamental designs. It is necessary that the original drawings should be done in lines and not in half-tint. At least, it is doubtful whether much success has as yet attended the production of half-tint photo-lithographs. A negative is taken from the drawing by the camera, and from it a print is made on paper coated with bichromatized gelatine much in the same way as in the autotype process. But before the print is developed, it receives a coating of lithographic transfer ink specially prepared for the purpose. It is next floated in warm water till the lines are seen as depressions. With the aid of a sponge and water at a temperature of about 150° F., the soluble portion is removed, leaving the picture in insoluble gelatine with its coating of transfer ink. It now only requires to be washed, dried, and transferred to the stone or zinc plate (see LITHOGRAPHY). Photo-lithographic prints have, as a rule, a disagreeably hard appearance if an atmospheric or distant effect is required.

Photo-Reliefs.—This term is applied to a picture in relief on metal which can be used like a woodcut in the ordinary printing-press. The image from an inked "transfer" of the same kind as that used in photo-lithography is transferred to zinc so as to form a resist to an etching fluid. Finely powdered rosin is added to the layer of ink to make a still better protecting surface. Weak hydrochloric acid is then applied, which so far etches the picture. Dilute sulphate of copper is next flooded over the zinc, which produces a fine deposit of metallic copper on the bare parts of the zinc. The plate is again immersed in the acid, and voltaic action now takes place, causing the zinc to dissolve where not covered by the ink. When the action ceases, the plate is washed with water. More ink and rosin, as well as new copper solution, is applied, and the plate again put into the acid. This operation is repeated till a sufficient depth is given to the relief. Electrotypes, which are sometimes faced with steel, are made from these zinc reliefs. This process is said to give very good results. There are a number of ways of making these relief blocks, several of which are by the use of a fatty transfer in some similar way to that above described, but without the voltaic action.

In the United States, a relief is made by exposing for a sufficient time a sheet of gelatine one-sixteenth of an inch thick under a negative picture, and, after fastening it to a flat piece of type-metal, the "unprinted" portion of the gelatine is dissolved in hot water. The "printed" portion is then in strong relief and can be used to print from, but it is generally electrotyped.

Photo-Engraving: Heliogravure or Photogravure.—Here, as in photo-lithography, the processes employed are for the most part only adapted to the reproduction of line work as distinguished from drawings in half tone or photographs from nature. It is curious that, so far as is publicly known, some of the best photo-engraving processes in use at the present time are based on the principle discovered by Niepce in the early part of the century, that bitumen of Judæa (asphaltum), when exposed to light, becomes insoluble in its ordinary solvents. Accordingly, the image which he got in the camera obscura on a silver plate coated with asphaltum was made bare, by the application of a solvent, to those parts which where not rendered insoluble. Up to the biting stage, a metal plate—usually copper—is still treated in a similar way. In the development, the asphaltum is softened with olive oil, and then turpentine is applied to dissolve the soluble portions, which leaves the lines forming the picture bare. It is then etched with diluted hydrochloric acid.

The production of meritorious half-tone engravings by a photographic method has proved itself to be a matter of great difficulty. Some modifications of the methods patented by Mr. Fox Talbot in 1852 and 1858 are understood to be in use. He called his process photoglyphic engraving. Talbot got the image with bichromatized gelatine. The necessary grain was given to the plate in two ways. By one of these he coated it after development with a fine deposit of rosin. It is then ready for the etching fluid. By the other method, he took fine muslin or netting, and applied it by mechanical pressure to the plate, which covered it with fine cross-lines. Goupil of Paris has a process which is believed to be worked upon the plan of forming a gelatine image, and then electrotyping it. Mr. Warnerke has produced photo-engraved plates—copies of ordinary engravings—which can hardly be distinguished from the originals. It is understood to be by an asphaltum process.

Photography is now much employed to transfer drawings and pictures from nature on to the wood for the wood-engraver. This process is of much importance, as the original drawing is preserved, not only for comparison with the finished engraving, but it may be for its artistic value. The drawing also may be made of any convenient size, and reduced on the wood, a great consideration when minute objects are to be represented. One process is as follows: The surface of the wood is prepared with a ground of water-color Chinese white, and to harden it enough to resist the subsequent washings, the enamel of a glazed card is added. It is then coated three times: (1) With a solution of albumen, and dried; (2) with a solution of albumen and chloride of ammonium, and again dried; (3) with a mixture of 1 ounce ether, 1 ounce alcohol, 8 grains gun-cotton,

and 30 grains nitrate of silver. On this surface the subject is printed from the negative, after which the collodion is dissolved off by alcohol and ether. The image is fixed with hyposulphite of soda, and when washed and dried, is ready for the engraver, who now engraves the block in the usual way.

Photo-Micrography consists in the enlargement of microscopic objects, by means of the microscope, and the projection of the enlarged image on sensitized collodion. It is necessary to employ a collodion yielding what is termed a structureless film. The principle upon which the enlargement is effected is that of the conjugate foci. By reversing the arrangement, minute photographs of engravings, or other objects, may be produced which would require a microscope for their inspection.

Celestial Photography comprehends the application of photography to the automatic registration of celestial phenomena. Among the facts established by Warren de la Rue's researches is the demonstration of the sphericity of the moon by means of the stereoscope and lunar photographs, also the determination of the nature of many of the more obscure markings on its surface, by which elevations are clearly distinguished from depressions. The faculæ and spots on the sun's surface have also been photographed, and examined stereoscopically, by which they have been found to arise from elevations of the outer regions of the photosphere. Photographs have also been obtained of Lyra and Castor, and of the nebulæ in Orion. The instrument employed for the purpose is called a photo-heliograph. Photography has also been extensively employed in connection with solar and stellar spectroscopy.

Photography in Colors.—It has long been the dream of photographers to devise some process by which the camera can fix not only the features, outlines, and light and shade of the objects photographed, but their natural colors as well. Many attempts have hitherto been made, but none of them can be fairly described as more than partially successful. As early as 1810, Seebeck observed that chloride of silver takes approximately the colors of the incident rays. In 1840, Herschel observed that colors could be rendered with some exactness on sensitized film. Eight years later M. Edmond Becquerel succeeded in obtaining the prismatic colors upon a film of sub-chloride of silver spread upon a plate similar to the one employed by Daguerre, but this picture requires a long exposure, and disappears after a while. Other experimenters obtained similar results, but the same grave difficulty remains—exposure to the light ultimately destroys the picture. In 1869 MM. Ducos du Hanson and Charles Crox proposed, independently, a process which was fairly successful in theory, but too complex for practical use. It consisted in taking several proofs in various tones, and then, by successive printings, superimposing these tones—an operation that gave results similar to those of chromo-lithography, but with no exactness of color.

A close approach to success has been made by an Englishman, Mr. F. Bligh Bond, who in 1890 succeeded in making three gelatine plates sensitive to the yellow, blue, and red rays of the spectrum, respectively. These plates after being developed are printed from by the Collotype process, and give good results as far as they go. In February, 1891, Prof. Gabriel Lippmann, professor of Physics at the Sorbonne, Paris, succeeded even more fully by an application of the theory of undulation.

Light, like sound, is but a form of motion. Both appear to propagate themselves by a wave-like motion similar to the ripples on a pond. A curious property of sound or light waves is that when they meet another wave of equal length coming in an opposite direction the conflicting waves overlap each other, the continuity is broken, and a succession of dark and light, or silent and loud, intervals are produced. A French physician of the beginning of this century, Napoléon Savart, was the discoverer of the phenomenon called interference of sound. If the ear is placed at a short distance off a sounding or echoing plate, and gradually drawn away, it will be observed that the sound alternately dies away and comes back with twofold intensity. The explanation of this is that the waves of sound, the direct and reflex waves, alternately neutralize and re-enforce each other.

Some time ago it occurred to M. Lippmann that if, instead of a continuous wave of light crossing the photographic plate, a broken line (produced by "interference") were sent across it, the silver, instead of being precipitated in one mass throughout the gelatino-bromide, would settle in layers (about the thickness of the soap bubble). By placing a looking-glass behind the plate, the red light, for instance, caused the silver to be deposited in layers of half the thickness of a red wave length. Blue light would cause the layers to be somewhat thicker wherever it passed, but these layers, coinciding exactly as they do with the length of a wave of light, can only let pass the same light which originated them.

This is the principle of M. Lippmann's discovery, and that it will reproduce the colors of the solar spectrum is certain. It has not yet been determined whether it will also reproduce composite hues and delicate shades. At present, the time required for posing will prevent the process from being used to reproduce human likenesses.

Recent Applications of Photography.—The development, improvements, and new applications of photography introduced every year are so numerous as to render a detailed description of each impossible. Of late, what is known as "art photography" has become very popular, the object being to produce photographs that are as little like photographs as possible. Instantaneous photography has also been brought to a remark-

able degree of perfection. In 1890, Mr. Louis Meldon, an English photographer, took a photograph of a bicycle-race in $\frac{1}{500}$ths of a second. In it the spokes of the wheels are distinctly discernible, and the whole picture is in the most perfect focus. Some admirable instantaneous photographs of race-horses have been made, and by them much that is new has been learned of the position assumed by the limbs while in rapid motion. Chemists are continually working to advance photographic art, and a recent discovery is the use of *primuline*, a derivative of coal-tar, as a printing process. By means of it, direct positive printing is done upon such materials as silk, satin, cotton goods, calico, wall-papers, etc. Films made of celluloid are now prepared with a coating of sensitive emulsion. These can be rolled upon a spool, so that one can carry in his pocket with no fear of breakage, material for any number of pictures, thus rendering the photographer independent of glass plates. This rollable film is made use of by Edison in his curious application of photography, the *Kinetograph* (q.v. under PHONOGRAPH), which, by the use of the instantaneous process, does for the eye what the phonograph does for the ear. In the Kinetograph, something like a mile of gelatine film is required.

In 1891, Dr. Nicol, a well-known experimenter, succeeded in simplifying considerably the Calotype process. Formerly the paper was coated with the salts of iron and printed, then developed by flowing over with a solution of nitrate of silver. The improvement consists in combining with the iron salts on the paper the silver salt, and printing in the usual way, for from two to four minutes, then developing the print by immersion in a bath of water and Rochelle salt, to which is added an equal quantity of pulverized borax. The tone will be lighter if less borax is added, and may be varied according to the amount in the developer.

The prints are left in the developer from fifteen to twenty minutes and then washed in water, one gallon, and ammonium, one ounce. They should pass through two separate baths of this kind, followed by a slight rinse in plain water, when they are dried and finished. He says that albumenized paper may be sensitized in the same way.

The paper will keep after being sensitized, and has the advantage of being capable of producing permanent pictures in a quick and easy way.

Photography has become of late of much practical value in many spheres. All the large hospitals have a photographic department, and in the operating room the camera is constantly required to preserve the record of curious and interesting cases. In astronomy (q.v.), the photographic camera has accomplished wonderful results, in revealing objects that are invisible without its aid. A careful study of the negative of the surface of the moon made by the help of the great Lick telescope in 1890–91 has shown the existence of crater mountains, rifts, and streaks hitherto unknown. For instance, near the great crater known as Copernicus, another crater of nearly equal dimensions is shown upon the negatives, although it is absent from the most elaborate maps of the moon and cannot be seen even with the Lick telescope, except when the eye of the camera, instead of the human retina, is applied to look for it. It appears extraordinary that it should escape detection by the telescope when directed to the moon, and yet be visible upon a photograph of the moon. The reason appears to be that the walls of this newly discovered crater were long ago destroyed, being razed by some denuding force nearly to the level of the surrounding surface. It is consequently but the remnant of a great crater ring. Even in that condition, however, it would be visible to the eye, but for the fact that Copernicus, whose walls are still standing to a great height, is surrounded by enormous masses of luminous material, which reflects back the light of the sun with overpowering brilliancy. The glare of this broad reflecting surface is so great as to conceal the comparatively low relief of the broken crater ring.

Retouching.—Many defects in the subject of a photograph are exaggerated by the lens, as, for example, freckles, whose color-value, yellow, in photography appears much darker than to the eye of the beholder in life. In fact, it has been claimed that in the case of a small-pox patient, a photograph taken a day before the appearance of the characteristic rash, showed it in the skin, though at the time when the photograph was taken, it was invisible on the person of the sitter. Again, the vanity of many who sit for their likeness requires that the photographer shall in some way produce a "flattering" result and give a photograph in which wrinkles shall be smoothed away, moles, warts, and blemishes eliminated, and other defects softened or removed. In order to meet this demand, the process known as "retouching" is much employed.

This is described by a well-known authority, Mr. Clarence B. Moore, as follows: "The portions of the negative to be retouched, first with the aid of a little cotton having been covered with a 'retouching' varnish, the retoucher with a lead pencil begins his work. It must be borne in mind that shades as well as positions are reversed upon a negative, white becoming black, and vice versa. Moles, freckles, wrinkles, etc., being dark in color, appear white; and these the pencil of the retoucher darkens to the same tint as the surrounding skin in such a manner that they are entirely merged and disappear. With such defects as appear in black upon the negative and will consequently be reproduced in white upon the print, the retoucher has nothing to do, it being the duty of the 'spotter' later on, with a brush and India ink, to paint them out on the finished photograph. After the retoucher has removed such blemishes or unwelcome traces of the ravages of time as lie in his power, the negative has a mottled look, which is rectified by going carefully over the high lights and giving a smoother appearance to the face."

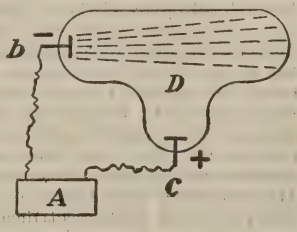
Instantaneous processes are now much in vogue. The *Amateur Photographer* (1890), reproduces a picture taken and handed to the person to be photographed within thirty seconds. In what is known as "pin-hole" work the photograph is taken without a lens. The sensitive plate is exposed to the rays of light passing through an aperture of $\frac{1}{100}$th to $\frac{1}{60}$th of an inch in diameter, with an exposure of from five to ten minutes.

Amateur Photography.—An invention that has done more than all others to popularize photography is what is known as the "dry process," which consists in using gelatine instead of collodion for coating the plates. Besides having the advantage of cheapness, the gelatinized sensitive plates can be bought from the manufacturer, and kept always on hand ready for use, and they do not need to be developed immediately, but can be put away for future convenience. Sheets of celluloid, coated with sensitized emulsion, and known as "transparent films," are now extensively used instead of glass, and although they are more expensive, their lightness of weight makes them peculiarly acceptable to the amateur. The "blue print" process has come into extensive use: paper is prepared with a solution of oxalate of iron, and kept in the dark till used; after exposure in the camera, it should be kept for a few minutes in the light; it is then dipped in a bath containing a solution of red prussiate of potash.

Of late years amateur photography has become very popular, and invention has been stimulated to minimize the difficulty of taking good pictures with little or no experience. The most ingenious photographic apparatus, as well as the most convenient, is that which is known all over the world as the Kodak. The Kodak is an oblong box covered with black morocco, having in one end a lens aperture, on the top a folding key, a cord, and a revolving disk, and on the side a button. When not in use it is enclosed in a neat, hand-sewed, sole leather carrying case with shoulder-strap. One end of the Kodak box contains the lens and shutter mechanism, and the other end the roll-holder for operating the band of sensitive film. When the button at the right is pressed the shutter drops down, allowing the light to pass through the lens. The picture is taken during the brief instant occupied by the opening in the shutter in passing the lens. By pulling the cord at the top the shutter can be set for another exposure; an ingenious device prevents the light from entering the lens while the shutter is being set. The sensitive film is wound on a wood spool, which is removably inserted into the roll-holder, and the end of the film carried over the exposing bed and attached to the reel, which is operated by the key. The film, as it is wound off by the key, turns an indicator, seen through a hole in the top of the Kodak, which shows the operator just how far to turn for each picture; at the same time, the film is automatically marked to show the division line between the pictures. On one spool of film 100 pictures can be taken, and the negatives can then be developed by the operator or by any photographer. Pictures taken by the Kodak vary in size with the size and cost of the apparatus, the largest being about 6 in. by 4 in., and the cost of the apparatus from $25 to $60. In 1891, there were more than 400 associations of amateur photographers in England and the United States. The "Jubilee of Photography" was celebrated in August, 1889, that being the fiftieth anniversary of Daguerre's demonstration of his process.

The Roentgen Photography.—Photography through substances which are opaque to the visible rays of the spectrum has recently been accomplished by means of a newly discovered form of radiation announced by Prof. Roentgen of the University of Wurzburg, in December, 1895. The precise nature of the Roentgen rays is not yet understood, but they possess characteristics different from those of the ultra-violet rays of the spectrum, or of cathode rays. Photographic plates are sensitive to these rays, but instead of the negatives being produced by reflected light from the object photographed in the usual way, the Roentgen rays produce positive impressions on the photographic plate, similar to silhouettes, the object photographed being placed between the source of the rays and the sensitized plate. In this position the parts of the object which are opaque to the Roentgen rays throw a deep shadow upon the plate, while the parts more or less transparent to these rays throw shadows of different intensities, proportional to their transparency. Shadow pictures are thus produced in which the lights and shades impressed upon the photographic plate are of an intensity proportional to the interception, or the transmission of the rays by the various components of the object photographed.

Most, if not all, substances are transparent to these rays, but in very different degrees, and also in proportion to their thickness. A human hand photographed by this process shows every bone clearly outlined, and the surrounding flesh, which is much more transparent to the Roentgen rays than the bones are, shows a comparatively faint shadow. The method employed by Prof. Roentgen to produce this form of radiation is to pass the discharge from a large Rühmkorff coil *A*, through a Crookes or other high vacuum tube *D*, whose electrodes *b* and *c* are connected to the negative and positive poles as shown.



According to Crookes's theory, particles of the attenuated gas are projected from the electrode *b* at a high velocity, which in striking the glass cause it to fluoresce. The streams from the pole *b* are called cathode rays, and if a thin sheet of aluminum is inserted in the glass in front of these rays they will pass through it into the air, which

rapidly absorbs them, and which becomes fluorescent. These cathode rays are deflected from their path by the force of a magnet, and they are absorbed more rapidly by solid bodies than by air. Roentgen has discovered that another form of radiant energy is present when the cathode rays are produced, which possesses some properties distinctly different from the latter. They both produce fluorescence, but the Roentgen rays are not at all deflected by a magnet, and they are neither absorbed by the air nor by many dense substances. Even metals are transparent in some degree to the Roentgen rays.

If the discharge tube *D* is inclosed in a cover of black cardboard and placed in an entirely darkened room, screens of glass, rock-salt, calcium compounds, and many other substances will light up brilliantly at a distance of even six feet from the apparatus. The rays from the tube are entirely invisible to the eye, but act upon a photographic plate. A printed book of 1000 pages placed between the apparatus and the screen is found to be quite transparent to these rays, and the screen also becomes fluorescent when placed behind wood, vulcanized rubber, thin sheet metals, glass, etc. With increased thicknesses of these materials shadows of more or less intensity are thrown upon the screen. These shadows are reproduced upon the photographic plate through the cover of the plate-holder, which is not opened.

These rays cannot be reflected on account of the transparency of all materials to them, and they are not appreciably refracted by passing through prisms or lenses. These properties distinguish these rays from the ultra-violet rays of the spectrum. The centre from which the Roentgen rays appear to radiate in all directions is the place on the wall of the discharge tube, upon which the cathode rays are projected. The relation between these rays and visible light is shown by their chemical activity on a photographic plate, and suggests some kind of ether vibrations as their origin. The evidently longitudinal character of the Roentgen waves has led their discoverer to believe that they may prove to be the longitudinal vibrations of the ether, the exience of which scientists have not yet been able to determine, but which from Helmholtz's theory of light, and from mathematical deductions, should be expected to take place.

Among the properties of Roentgen rays which have been determined recently, is the discharging by them of positively and negatively electrified bodies in air. The more powerful the rays the quicker the discharge. This as well as some other phenomena recorded by Prof. Roentgen was observed by him in a hermetically sealed zinc box provided with a sheet aluminum window through which the rays could pass. The zinc box was made just large enough to contain the observer and the necessary instruments, and one of the walls, behind which the electrical apparatus was placed, was lead covered. These precautions were taken so that the discharge of the electrified bodies would be protected against the electrostatic influences of the vacuum tube, induction coils, etc., as well as from the air in the vicinity of the discharge apparatus outside the box. The intensity of the rays used to discharge electrified bodies was measured by a photographic plate or on a fluorescent screen. It appears to make no difference in respect to their discharge whether the electrified bodies are conductors or insulators. No specific difference has been found in the rate of discharge of different bodies, and similarly no difference has been noticed in regard to the behavior of positive and negative electricity. These experiments tended to show that air traversed by the Roentgen rays also acquired the property of discharging electrified bodies.

Prof. Oliver J. Lodge has made some experiments to verify the statement that the Roentgen rays are not at all affected by a magnet even when the rays are strongly electrified. As experiments on magnetic deflection are liable to disturbance owing to the action of a powerful magnet in displacing the cathode rays in the bulb, and so changing the position of the source of the Roentgen rays, Prof. Lodge made careful experiments on the twisting of the rays traveling along the lines of magnetic force. It is known, for example, that a certain form of Crookes tube is provided with an interior metal cross which will throw a shadow on one end of the glass tube. If such a tube be surrounded by a helix carrying a current, the shadow of the cross will appear considerably twisted, and the twist will be reversed according to the direction of magnetization. This proves that the cathode rays travel spirally along a magnetic field. An analogous experiment upon Roentgen rays showed that they are not susceptible to magnetic influence. The magnet used by Dr. Lodge was a Faraday magnet with perforated pole pieces 5.6 cm. apart, giving a field at the middle of 5,600 C. G. S. lines of force per square centimeter, when excited by 20 storage cells. In the centre of this field a hemisphere of aluminum was placed, and was highly electrified, so as to be on the verge of sparking to one of the pole pieces. On the inside of the hemisphere a couple of parallel copper wires were fastened which the rays passed before entering the electric field, thereby throwing a shadow of them on the sensitive plate. Another piece of wire parallel to the other two was fixed in the passage, outside of either field, close to the plate, and after an exposure to the rays the plate was developed. The shadows of the three wires came out sharply as three parallel lines lying close together. Measurements were taken in successive experiments to note whether the parallelism was preserved with electrification or with the magnetism reversed, but not the least angular twist of the pair of wires with reference to the single wire was shown in any of the experiments.

For six months following the discovery of this form of radiation experiments have

been constantly in progress by the most eminent scientists of the world, to determine the exact nature of the Roentgen rays, but it is worthy of note that Prof. Roentgen's original announcement of his discovery included practically all that we yet know.

Since the introduction of Roentgen photography vacuum tubes have been manufactured in innumerable designs, with a view to obtaining the most powerful source of these rays. In the old-fashioned forms of Crookes tubes the rays proceeded from the fluorescent spots on the glass, where the diffused cathode rays struck upon the walls of the tube from a reflector which was not focussed. With this form of tube the rays proceed from the whole surface of the tube, and in order to cast a sharp shadow on the sensitized plate the tube must consequently be very small. A new form of tube known as a focus tube has been devised for this form of photography which is a much more powerful source of Roentgen rays. These rays appear to emanate from the first surface impinged upon by the cathode rays, whether it be metal or glass, and metal appears to be a more powerful source than glass. Of the different metals platinum seems to be the best for this purpose. This discovery is utilized in the focus tubes, which are made with the cathode pole in the shape of a focussing reflector, which concentrates the cathode rays upon a platinum plate within the tube, which plate then becomes the source from which the Roentgen rays are diffused. These tubes produce pictures far more distinct than those made with the unfocussed tubes. If the tube is connected with an induction coil the discharge through it will be pulsating, but always in the same direction, so that one terminal will always remain the cathode, and only this terminal will need to be focussed. If, however, a condenser and Tesla coil are employed the discharge will be oscillatory, and both terminals will be alternately anode and cathode, and in this case both terminals are focussed on the platinum plate which has no outside connection. Both terminals then become alternately cathodes and project the cathode rays on the plate where the Roentgen rays are generated.

The fluoroscope is an important addition to a Roentgen photographic outfit, by means of which one is able to perceive the shadows of objects without developing them on a photographic plate. This instrument is made in the shape of a hollow truncated pyramid, the smaller end being left open and made to fit over the eyes and face, so as to exclude all light from the interior of the box. The base of the box opposite this opening is a fluorescent screen, which is made of a piece of cardboard coated with a platino-cyanide salt or with calcium tungstate crystals or any material which becomes fluorescent under the action of Roentgen rays. The interior of the box must be light-tight. If an object, such as the hand, for example, be placed between the source of the rays and the fluoroscope, the shadows of the bones will be clearly outlined on the fluorescent screen. In taking Roentgen photographs fluorescent screens are of great advantage in reducing the time necessary for exposure of the plates. This is accomplished by placing the screen against the plate, and is of special importance in surgical work, where an enforced posture for a long time exposure might prove dangerous.

Bibliography, Wall; *Dictionary of Photography* (1889); Burton, *Modern Photography* (1889); Malley, *Photo-micrography* (1889); Eder, *Modern Dry Plates* (1889); Robinson, *Art Photography* (1890); Wilkinson, *Photogravure* (1890); Werge, *Evolution of Photography* (1890); Harrison, *History of Photography* (1889); Fabre, *Traité Encyclopédique de Photographie* (1889); Meldola, *Chemistry of Photography* (1889); Balaguy, *Traité de Photographie* (1890); Pringle, *Practical Photomicrography* (1890).

PHOTOGRAVURE. See PHOTOGRAPHY.

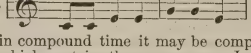
PHOTOM'ETER (Gr. *phōs*, light; *metron*, measure), an instrument for measuring the intensity of light. The first who occupied himself in scientifically determining the intensity of light was Bouguer; but his investigations were far surpassed by those of Lambert, about 1760. The latter indicated an exceedingly simple and effective kind of photometer, which was afterwards constructed by Rumford. The instrument consists of a screen of thin paper placed vertically, and behind it, at the distance of a few inches, is placed a cylindrical stick, or any other similar body. When the intensity of light from two flames is to be compared, they are placed behind this stick in such a way that each casts a separate shadow of the stick upon the paper screen. The observer stands in front of the screen, and directs the removal of the two lights either to or from the stick, till the shadows which are cast upon the screen are equally obscure. The distance of each light from the shadow it casts on the screen is then measured, and the squares of these distances give the relative intensities of the two lights. This photometer may also be modified by employing, instead of a cylindrical stick, a second screen parallel to the first, but of greater thickness, and having an aperture cut in its center. The two lights being then placed behind the second screen, and considerably apart, each casts a separate illumination through the aperture in the second upon the first screen, and the observer in front of the latter changes their relative distances till the illuminations appear to the eye of equal intensity. The calculation is the same as before. There are several other classes of photometers, which, however, do not deserve the name, as they depend upon the heating and chemical powers which generally accompany light, and not upon the intensity of its action on the organs of vision. The Bunsen photometer, which is in most general use, consists of a long box, at one end of which is the standard light, and at the other end is placed the light to be tested. At the center of the box is placed a sheet of paper, so as to separate the two lights, the paper having a spot in the center made translucent with oil or paraffin. The candle-power is found by adjusting the standard light and the one to be measured at such distances from the paper partition that both sides of the spot in the center are equally illuminated, at which point the spot

is nearly invisible. The relative distances of the lights from the paper determine the candle-power with comparison to the standard light. In order to render both sides of the paper visible at once to the observer, two mirrors are mounted obliquely either side of the paper, both of which can be viewed from an aperture in front of the photometer.

PHOTOPHONE. See SPECTROPHONE.

PHOTO-SCULPTURE, invented by M. Willème in 1867, is an ingenious use of photography to assist a sculptor in modeling portrait statues, or fac-similes and reduced reproductions of other statues. The subject stands in the center of a circular chamber, and is simultaneously photographed by no less than 24 cameras, arranged at equal distances round the chamber. The 24 photographs are subsequently made available in the sculptor's studio, where the clay model is arranged on a frame capable of being turned round. A magic lantern throws the outline of photograph No. 1 on a screen in front of the artist, who by means of a pantograph brings this outline to bear on the clay in its first position. The model is then turned round $\frac{1}{24}$th of a revolution, and the outline of photograph No. 2 is taken advantage of. Thus the modeler works his way in 24 changes round the model, and the likeness or fac-simile or reduced figure of the original is or should be complete. The method has been also applied to the taking of medallions and the like.

PHRAGMITES'. See REED.

PHRASE, the name given, in music, to the simple motives containing in themselves no satisfactory musical idea, which enter into the composition of every melody containing a perfect musical idea, e.g.,  The phrase most usually consists of two measures; in compound time it may be comprised in one measure, and an extended phrase is one which contains three measures. In the more simple and regular forms of musical composition, two phrases unite to form a section ending in a cadence; and a perfect musical idea is formed of two such sections terminating, the first with the dominant, the second with the tonic harmony. See MUSIC.

PHRENI'TIS. See MENINGITIS.

PHRENOL'OGY is a Greek compound signifying a discourse on the mind, but is used in a more limited sense to mean a theory of mental philosophy founded on the observation and discovery of the functions of the brain, in so far as it is concerned in intellectual and emotional phenomena. Phrenology takes into view likewise the influence of all other parts of the body, and of external agents affecting these, upon the brain.

The founder of this system was Dr. Franz Joseph Gall (q.v.), who died in 1828. In Britain it has been amply expounded by his pupil Dr. Spurzheim (q.v.), by George and Andrew Combe (q.v.), by Dr. Elliotson of London, and others. In America, Dr. Charles Caldwell has been its ablest advocate. Gall's method of investigating the functions of the brain is that which, applied to other organs, has led to the discovery of their functions, but which had never before been systematically applied to the brain. When a physiologist wished to ascertain the functions of any part of the body, he did not rest satisfied with examining its structure, and speculating on the purposes for which that structure seemed to be adapted. He observed what kind of function appeared during life as the invariable accompaniment of the presence and action of that particular part; and, by repeated and careful observation, he at last succeeded in discovering the function. The knowledge thus obtained was afterwards verified and completed by examination of the structure, and observation of the effects of its injury or diseases. To the adoption of this principle in studying the functions of the brain, Gall was led by observing at school the concomitance of a quick and retentive memory of words with a peculiar appearance of the eye, which he afterwards found to be caused by a large development of a particular part of the brain. At school, at college, and in many other places, and under the most different circumstances, the same concomitance of talent with development of brain came under his notice so frequently as to suggest to him the probability that there might be discovered by the same method a connection of other talents and dispositions with other portions of the brain. It was by the diligent application of the method of inquiry which accident had thus suggested to him, and not, as some suppose, by the exercise of his imagination, that Dr. Gall was at last led to conclude, first, that the brain is an aggregate of many different parts, each serving for the manifestation of a particular mental faculty; and, secondly, that, *all other conditions being equal,* the size of each of these cerebral organs is a measure of the power of its function. These two propositions constitute the distinctive or fundamental principles of phrenology. The first of them, however, is not new. The impossibility of reconciling actual phenomena with the notion of a single organ of the mind has, for many centuries, suggested the probability of a plurality of organs in the brain. But the phrenologists hold that Dr. Gall was the first to *demonstrate* the fact, and to make any considerable progress in determining with what parts of the brain the various intellectual and emotional faculties and susceptibilities are connected.

That man, in his present state, cannot think, will, or feel without the intervention of the

brain, is generally admitted by physiologists, and appears from even the fact that, by pressure applied to it, consciousness is at once suspended. That it is not a single organ is *à priori* probable from such considerations as these: 1. It is a law in physiology that different functions are never performed by the same organ. The stomach, liver, heart, eyes, ears, have each a separate duty. Different nerves are necessary to motion and feeling, and there is no example of confusion amongst them. 2. The mental powers do not all come at once, as they would were the brain one organ. They appear successively, and the brain undergoes a corresponding change. 3. Genius varies in different individuals: one has a *turn*, as it is called, for one thing, and another for something different. 4. Dreaming is explained by the doctrine of distinct organs which can act or rest alone. 5. Partial insanity, or madness on one point with sanity on every other, similarly points to a plurality of cerebral organs. 6. Partial injuries of the brain, affecting the mental manifestations of the injured parts, but leaving the other faculties sound, tend to the same conclusion. 7. There could be no such state of mind as the familiar one where our feelings contend with each other, if the brain were one organ.

These are grounds for presuming that the brain is not single, but a *cluster of organs*, or at least that it is capable of acting in parts as well as in whole. For this conclusion the phrenologists consider that they have found satisfactory proofs in numerous observations, showing that particular manifestations of mind are proportioned, in intensity and frequency of recurrence, to the size or expansion of particular parts of the brain—this law being subject to modification in the case of the brain, as in that of the muscles and other parts of the body, by differences of health, quality, exercise, etc.

If the size of organ, *cæteris paribus*, is the measure of the vigor of function, it is of great moment in what region of the brain the organs are largest—whether in the animal, moral, or intellectual. On this preponderance depends the character. Two brains may be exactly alike in size generally, yet the characters may be perfect contrasts to each other.

It is held by phrenologists—1. That by accurate observation of human actions, it is possible to discover the strength of the dispositions and intellectual powers of men; 2. That the form of the brain can, in normal subjects not beyond middle age, be ascertained with sufficient accuracy from the external form of the head—the brain, though the softer substance, being what determines the shape of the skull; 3. That the organs or parts of which the brain is composed appear on its surface in folds or convolutions, which have a well-ascertained fibrous connection with the *medulla oblongata*, which unites the brain to the spinal cord; 4. That the brain being divided into two equal parts called *hemispheres*, in each of which the same organ occurs, all the organs are double, like the ears and eyes. See Brain. But when the term *organ* is used, both organs are meant.

It is true that where strength is most needful, the skull is thicker than at other places; but this is not overlooked by phrenologists, nor do they fail to warn observers against mistaking for signs of cerebral development the bony processes and ridges which serve for the attachment of muscles to the skull. See Skull. They recognize also, as we shall see, the uncertainty often occasined by the frontal sinus.

Besides the brain proper, there is a smaller brain, lying below the hinder part of the main brain, and called the *cerebellum*.

The brain is divided into the *anterior*, *middle* and *posterior lobes*. The anterior lobe contains the organs of the intellectual faculties; the posterior lobe and lower range of the middle one are the regions of the animal propensities; while the moral sentiments are stated to have their organs developed on the top or coronal region of the head.

Phrenologists distinguish between *power* and *activity* in the mental faculties. Power, in whatever degree possessed, is *capability* of feeling, perceiving, or thinking; while activity is readiness and quickness in the exercise of power.

The powers of mind, as manifested by the organs, are called *faculties*. A faculty may be defined to be a particular power of thinking or feeling. A faculty is regarded as elementary or primary—1. When it exists in one kind of animal, and not in another; 2. When it varies in the two sexes of the same species; 3. When it is not in proportion to the other faculties of the same individual; 4. When it appears earlier or later in life than the other faculties; 5. When it may act or repose singly; 6. When it is propagated from parent to child; and 7. When it may singly preserve its soundness, or singly become deranged or extinct.

The faculties are usually divided by phrenologists into two orders—Feelings and Intellect, or Affective and Intellectual Faculties. The feelings are divided into two genera—the *propensities* and the *sentiments;* while the intellectual embrace the *perceptive* or *knowing*, and the *reflective faculties*. This classification, however, is avowedly imperfect.

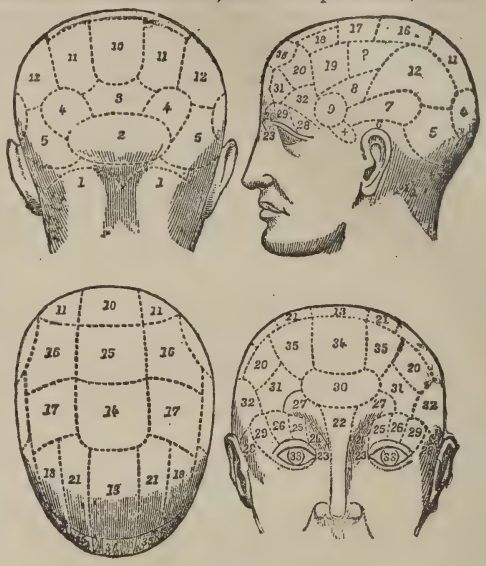
The following is a representation of the human head in four points of view, showing the positions of the cerebral organs, according to Mr. Combe:

1. *Amativeness*, or sexual love, is believed to have for its organ the cerebellum, or at least a portion of it. As the basis of domestic life, this faculty is of great importance, and its regulation has ever been one of the prime objects of moralists and legislators.

2. *Philoprogenitiveness*, or love of offspring, is generally strongest in the female. Its organ is one of the easiest to distinguish in the human head. Those who are flat and perpendicular there, instead of being delighted, are annoyed by children. The feeling

is said to give a tender sympathy with weakness and helplessness in general. The most savage races must have affection for their young, or they would become extinct. The organ, like the other cerebral parts, may become diseased, and insanity on the subject of children often occurs.

3. *Inhabitiveness* (called by Mr. Combe *Concentrativeness*) has its organ immediately above the preceding. Dr. Gall did not discover its function; and Dr. Spurzheim, observing it large in persons attached to their native place, or any place in which they had long dwelt, called it *inhabitiveness*. Mr. Combe thought it has a more extended sphere of action. He observed it large in those who can detain continuously their feelings and ideas in their minds; while the feelings and ideas of others pass away like the images in a mirror, so that they are incapable of taking systematic views of a subject, or *concentrating* their powers to bear on one point. The organ is stated as only probable, till further facts are obtained.



4. *Adhesiveness.* — The organ of this feeling was discovered by Gall, from being found very large in a lady remarkable for the warmth and steadiness of her friendships. It attaches men and gregarious animals to each other, and is the foundation of that pleasure which mankind feel in bestowing and receiving friendship, and in associating with each other. Acting with amativeness, it gives constancy and duration to the attachment of the married. Generally speaking, adhesiveness is strongest and its organ largest in woman.

5. *Combativeness.*—Dr. Gall discovered the organ of this propensity by a vast number of observations on the heads of persons fond of fighting. Dr. Spurzheim extended its function to *contention* in general, whether physical or moral. Those deficient in it show that over-gentle and indolent character which yields to aggression, is easily repelled by the appearance of difficulty and trouble, and naturally seeks the shades and eddy-corners of life.

6. *Destructiveness.*—The propensity to destroy is abundantly manifested by man and carnivorous animals, and, when too strong or ill-regulated, is the source of cruelty and wanton mischief. As a defensive power it is of high utility. Anger, resentment, and indignation, spring from it. A small endowment is one of the elements of a "soft" character; while persons who have much of it are generally marked by an energetic, and probably fierce and passionate character.

AFFECTIVE.

I.—Propensities.

1. Amativeness.
2. Philoprogenitiveness.
3. Inhabitiveness or Concentrativeness.
4. Adhesiveness.
5. Combativeness.
6. Destructiveness.
   [Alimentiveness.
   [Love of Life.]
7. Secretiveness.
8. Acquisitiveness.
9. Constructiveness.

II.—Sentiments.

10. Self-esteem.
11. Love of Approbation.
12. Cautiousness.
13. Benevolence.
14. Veneration.
15. Firmness.
16. Conscientiousness.
17. Hope.
18. Wonder.
19. Ideality.
20. Wit, or Ludicrousness.
21. Imitation.

INTELLECTUAL.

I.—Perceptive.

22. Individuality.
23. Form.
24. Size.
25. Weight.
26. Coloring.
27. Locality.
28. Number.
29. Order.
30. Eventuality.
31. Time.
32. Tune.
33. Language.

II.—Reflective.

34. Comparison.
35. Causality.

Alimentiveness and *love of life.*—Some of the recent phrenological works treat in this part of the order of the faculties, of a faculty of alimentiveness, or the propensity to eat and drink, and also of another which follows—viz., love of life. The first being represented as no more than *probable*, and the second as only *conjectural*, they have no number allotted to them on the bust. The place assigned to alimentiveness is marked by a cross on the side-view of the bust. Mr. Combe suggests that the organ of the love of life is probably a convolution at the base of the middle lobe of the brain, the size of which cannot be ascertained during life.

7. *Secretiveness* is the propensity to conceal, which in excess assumes the form of cunning. It helps animals both to avoid and to prey upon each other. In abuse, it leads to lying, hypocrisy, and fraud, and with acquisitiveness disposes to theft and swindling. The organ is subject to disease, and cunning madmen are difficult to deal with. Disease here often leads to belief in plots and conspiracies formed against the patient.

8. *Acquisitiveness.*—The existence of a cerebral organ for the desire of property is held by phrenologists to prove that this is not, as many have thought, a derived or secondary tendency. It is what lord Kames calls the "hoarding appetite." This explains the miser's desire to accumulate money, without regard to its use in the purchase of other enjoyment. When the organ is diseased, persons in easy circumstances are sometimes prone to pilfer everything of value, and often of no value, which comes in their way.

9. *Constructiveness* is the impulse to fashion and construct by changing the forms of matter. Many of the inferior animals possess it, as the beaver, bee, and birds. Physical nature consists of raw materials which constructiveness prompts and enables man to adapt to his purposes.

10. *Self-esteem* is the source of that self-complacency which enhances the pleasures of life, gives the individual confidence in his own powers, and enables him to apply them to the best advantage. It is sometimes called proper pride, or self-respect, in which form it aids the moral sentiments in resisting temptations to meanness and vice. Its deficiency renders a man too humble, and the world take him at his word, and push him aside. Its excess produces arrogance, selfishness, disobedience, and tyranny. Self-esteem becomes insane perhaps more frequently than any other faculty, and then shows itself in extravagant notions of self-importance. Such maniacs fancy themselves kings, emperors, and even the Supreme Being. The organ is generally larger in men than in women, and more men are insane from pride than women.

11. *Love of Approbation* is the desire of the good opinion, admiration, and praise of others. It is an excellent guard upon morals as well as manners. The loss of character, to those largely endowed with it, is worse than death. If the moral sentiments be strong, the desire will be for honest fame; but in meaner characters, the love of glory is a passion that has deluged the world with blood in all ages. Shamelessness is the effect of its deficiency, often observed in criminals. The organ oftener becomes diseased in women than in men, as in women it is more active than in the other sex generally.

12. *Cautiousness.*—The organ of this faculty is found large in persons much troubled with fears, hesitations, and doubts. Its normal character is well expressed by its name. When diseased, as it often is, the organ produces causeless dread of evil, despondency, and often suicide.

13. *Benevolence* is the desire to increase the happiness and lessen the misery of others. When strong, it prompts to active, laborious, and continued exertions, and, unless acquisitiveness be powerful, to liberal giving to promote its favorite object. Unregulated by conscientiousness and intellect, benevolence degenerates into profusion and facility. It often coexists with destructiveness in great force; as it did in Burns, whose poem on a wounded hare expresses both feelings highly excited.

14. *Veneration* has for its object *whoever* and *whatever is deemed venerable* by the individual. One man venerates what another treats with indifference, because his understanding leads him to consider that particular object as venerable, while his neighbor deems it otherwise. But any man with a large endowment of the organ will have a tendency to consider others as superior to himself. Veneration is the basis of loyalty, and, having the Deity for its highest object, forms an element in religious feeling. So liable is its organ to disease, that high devotional excitement is one of the most common forms of insanity.

15. *Firmness* is the source of fortitude, constancy, perseverance, and determination; when too powerful, it produces obstinacy, stubbornness, and infatuation. The want of it is a great defect in character. The English soldier is more persistent than the French, although in courage and spirit they are equal.

16. *Conscientiousness* gives the love of justice, but intellect is necessary to show on which side justice lies. The judge must hear both sides before deciding, and his very wish to be just will prompt him to do so. Conscientiousness not only curbs our faculties when too powerful, but stimulates those that are too weak, and incites us to duty even against strong inclinations. The existence of conscientiousness as an independent element in the human constitution explains some apparent inconsistencies in human conduct—that a man, for instance, is kind, forgiving, even devout, and yet not just. The organ is commonly larger in Europeans than in Asiatics and Africans; very generally it is deficient in the savage brain. When it is diseased, the insanity consists in morbid self-reproach, belief in imaginary debts, and the like.

17. *Hope* was regarded as a primary faculty by Spurzheim, but was never admitted by Gall, who considered it as a function of every faculty that *desires*. Dr. Spurzheim answered that we desire much of which we have no hope. It produces gayety and cheerfulness, looks on the sunny side of everything, and paints the future with bright colors. When not well regulated, hope leads to rash speculation, and in combination with acquisitiveness, to gambling, both at the gaming-table and in the counting-house. It tends to make the individual credulous of promised good, and often indolent.

18. *Wonder.*—Dr. Gall found the organ of this faculty large in seers of visions and dreamers of dreams, and in those who love to dwell on the marvelous, and easily believe in it. Persons who have it powerful are fond of news, especially if striking and wonderful, and are always expressing astonishment; their reading is much in the region of the marvelous, tales of wonder, of enchanters, ghosts, and witches. When the senti-

ment is excessive or diseased, it produces that peculiar fanaticism which attempts miracles, and (with language active) speaks in unknown tongues.

19. *Ideality.*—The organ of this faculty was observed by Dr. Gall to be prominent in the busts and portraits of deceased, and in the heads of a great number of living, poets. This confirmed to him the old classical adage, that the poet is born, not made. He called it the organ of poetry. The name of ideality was given to it by Dr. Spurzheim. This faculty is said to delight in the perfect, the exquisite, the *beau-idéal,* the beautiful and sublime. The organ is usually small in criminals and other coarse and brutal characters, for it is essential to refinement. It prompts to elegance and ornament in dress and furniture, and gives a taste for poetry, painting, statuary, and architecture. A point of interrogation is placed on the bust on the back part of the region of this organ, conjectured to be a different organ, but one allied to ideality. The existence of the faculty of ideality is held by phrenologists to prove that the sentiment of beauty is an original emotion of the mind, and to settle the controversy on that subject. See ÆSTHETICS.

20. *Wit, or the Sentiment of the Ludicrous.*—The phrenological writers have discussed at great length, and with not a little controversy, the metaphysical nature or analysis of this faculty. We need not follow them into this inquiry, as most of them are agreed that by means of it we feel and enjoy the *ludicrous.*

21. *Imitation.*—Dr. Gall found the prominence of this organ accompanied by instinctive, and often irrepressible mimicry. The tendency to imitate is evidently innate; from the earliest years it makes the young follow the customs and the manner of speech of those around them, and so preserves a convenient uniformity in the manners and externals of society. Celebrated actors always possess it strong, and by its means imitate the supposed manner, and even feel the sentiments, of their characters. Its organ is found large also in painters and sculptors of eminence. In its morbid states, the impulse to mimic becomes irresistible.

We now come to the intellectual faculties, or those which make us acquainted with things that exist, and with their qualities and relations. Dr. Spurzheim divided them into three genera—1. The external senses; 2. The internal senses, or perceptive faculties; 3. The reflecting faculties.

The external senses, as generally received, are five in number—*touch, taste, smell, hearing,* and *sight.* There seem to be two more—namely, the *sense of hunger* and *thirst,* and the *muscular sense,* or that by which we feel the state of our muscles as acted upon by force and resistance. Without this last sense we could not keep our balance, or suit our movements to the laws of the mechanical world. Whether each sense has a special cerebral organ in addition to its external apparatus and nerves, is a question regarded by phrenologists as still undetermined.

22. *Individuality,* the first in the list of the perceptive faculties, is not easily defined. It is said to take cognizance of individual objects as such, e.g., a horse or a tree. Other knowing faculties perceive the form, color, size, and weight of the horse, but individuality is thought to unite all these, and give the idea of a horse. It is regarded as the store-house of knowledge of things simply *existing.* When it is strong, without being accompanied by reflecting power, the mind is full of facts, but unable to reason from them. After puberty, the size of the organ of individuality, as well as of the neighboring organs of size, weight, coloring, and locality—all situated behind the superciliary ridge of the skull—is often rendered doubtful by the existence of a hollow space, of uncertain width and extent, between the two plates of the skull. This hollow is called the *frontal sinus;* and when it is large, there may be a great projection of the bone over the eyes, without a corresponding projection of brain within. When this part of the skull is flat, however, the organs must be *at least* as defective as the flatness indicates. Owing to the source of uncertainty here pointed out, and the smallness of the organs behind the eyebrows, the functions of those parts of the brain are not regarded as being so well ascertained as those of the larger organs, nor will a cautious phrenologist be too ready to pronounce them large.

23. *Form.*—When the organ of form is large, the eyes are wide asunder. Dr. Gall discovered it in persons remarkable for recognizing faces after long intervals, and although perhaps only once and briefly seen. The celebrated Cuvier owed much of his success in comparative anatomy to his large organ of form. Decandolle mentions that "his [Cuvier's] memory was particularly remarkable in what related to forms, considered in the widest sense of that word; the figure of an animal seen in reality or in drawing never left his mind, and served him as a point of comparison for all similar objects."

24. *Size.*—Every object has size or dimension; hence a faculty seems necessary to cognize this quality. The supposed organ is situated at the inner extremeties of the eyebrows, where they turn upon the nose. A perception of size (including distance) is important to our movements and actions, and essential to our safety.

25. *Weight.*—A power to perceive the different degrees of weight and force is likewise essential to man's movements, safety, and even existence. Phrenologists have generally localized the organ of that power in the part of the brain marked 25 on the bust

26. *Coloring.*—The organ of this faculty is large in great painters, especially great colorists, and gives an arched appearance to the eyebrow; for example, in Rubens, Titian, Rembrandt, Salvator Rosa, and Claude Lorraine. In cases of color-blindness, it is found small. Many persons, though able to distinguish colors, have no perception of their harmonies: for this perception a higher endowment of the faculty seems to be required.

27. *Locality.*—Dr. Gall was led to the discovery of this faculty by comparing his own difficulties with a companion's facilities in finding their way through the woods, where they had placed snares for birds, and marked nests, when studying natural history. Every material object must exist in some part of space, and that part of space becomes *place* in virtue of being so occupied. Objects themselves are cognized by individuality; but their place, the direction where they lie, the way to them, fall within the sphere of locality. Its organ is large in those who find their way easily, and vividly remember places in which they have been. It materially aids the traveler, and is supposed to give a love for traveling. The organ was large in Columbus, Cook, Park, Clarke, and other travelers.

28. *Number.*—The organ of this faculty is placed at the outer extremity of the eyebrows and angle of the eye. It occasions, when large, a fullness or breadth of that part of the head, and often pushes downward the external corner of the eye. When it is small, the part is flat and narrow between the eye and the temple. Dr. Gall called the faculty *les sens des rapports des nombres* (the sense of the relations of numbers), and assigned to it not only arithmetic, but mathematics in general. Dr Spurzheim more correctly limits its functions to arithmetic, algebra, and logarithms; geometry being the products of other faculties, particularly size and locality. Dr. Gall first observed the organ in a boy who could multiply and divide, mentally, ten or twelve by three figures, in less time than expert arithmeticians could with their pencils. Many such examples are on record.

29. *Order.*—The organ of this faculty is said to be large in those who are remarkable for love of method, neatness, arrangement, and symmetry, and are annoyed by confusion and irregularity. In savages, whose habits are slovenly, filthy, and disgusting, the organ is comparatively small.

30. *Eventuality.*—The organ is situated in the very center of the forehead, and when large, gives to this part of the head a rounded prominency. Individuality has been called the faculty of *nouns;* eventuality is the faculty of *verbs.* The first perceives merely things that exist; the other, motion, change, event, history. The most powerful *knowing* minds have a large endowment of both individuality and eventuality; and such persons, even with a moderate reflecting capability, are the clever men in society—the acute men of business—the ready practical lawyers. The organ of eventuality is generally well developed in children, and their appetite for *stories* corresponds.

31. *Time.*—Some persons are called walking time-pieces; they can tell the hour without looking at a watch; and some even can do so, nearly, when waking in the night. The impulse to mark time is too common, too natural, and too strong, not to be the result of a faculty; it is an element in the love of dancing, almost universal in both savage and civilized man.

32. *Tune.*—The organ of tune is large in great musicians; and when it is small, there is an utter incapacity to distinguish either melody or harmony. The great bulk of mankind possess it in a moderate endowment, so as to be capable of enjoying music in some degree. Those in whom it is large and active become, in all stages of society, distinguished artists, exercising a peculiar power over their fellow-creatures, so as to rouse, melt, soothe, and gratify them at pleasure. But the gift, in this active form, is liable to be much modified according as it is accompanied by adhesiveness, combativeness, ideality, benevolence, wit, and other faculties.

33. *Language.*—The comparative facility with which different men clothe their thoughts in words, and learn to repeat them by heart, depends on the size of the organ of language, which is situated on the super-obitar plate, immediately over the eyeball, and when large, pushes the eye outwards, and sometimes downwards, producing, in the latter case, a wrinkling or pursing of the lower eyelid. Verbal memory is strong or weak, without relation to the strength or weakness of the memory of things, forms, or numbers.

The perceptive organs are for the most part called into activity by *external* objects; but internal causes often excite them, and objects are then perceived which have no external existence, but which, nevertheless, the individual may believe to be real. This is the explanation of visions and ghosts, and of the fact that two persons never see the same specters at the same time. Excess or disease in the organ of wonder predisposes to belief in the marvelous and supernatural, and probably stimulates the perceptive organs into action when spectral illusions are the consequence.

34. *Comparison.*—Dr. Gall discovered the organ of this faculty in a man of science who reasoned chiefly by means of analogies and comparisons, and rarely by logical deductions. The middle of the upper part of his forehead was very prominent. The precise nature of the faculty has been much disputed among phrenologists, but they seem to agree that the perception of analogy depends upon it. Every faculty, we are told, can compare its own objects: coloring can compare colors; weight, weights; form,

forms; tune, sounds: but comparison can compare a color with a note, or a form with a weight, etc. Analogy is a comparison not of things, but of their relations.

35. *Causality.*—This is regarded as the highest and noblest of the intellectual powers. Dr. Spurzheim so named it from believing that it traces the connection between *cause* and *effect*, and recognizes the relation of ideas to each other in respect of *necessary consequence*. Some metaphysicians have held that we have no idea of cause, but see only sequence, or one event following another. See CAUSE. It is true that we do see sequence; but we have a *third* idea—that of power, agency, or efficiency, existing in some way in the antecedent, to produce the consequent. Whence do we get this third idea?—from a distinct faculty, causality. It is a large ingredient in wisdom.

The phrenologists have chiefly confined their attention to the organs of the brain, and the various faculties of which these are the instruments. The former writers on mind—Reid, Stewart, Brown, and others—gave, on the contrary, their chief care to the mental acts called attention, perception, conception, etc., which they considered as faculties. The phrenologist does not overlook the importance of this department of mental philosophy, but differs from the metaphysicians in considering perception, conception, memory, etc., as only *modes* in which the real faculties above described *act*. This distinction is one of great importance.

According to the phrenologists, the faculties are not mere passive susceptibilities; they all tend to action. When duly active, the actions they produce are proper or necessary; in excess or abuse, they are improper, vicious, or criminal. Small moral organs do not produce abuses; but they are unable to prevent the abuse of the animal organs, as larger tend to do; thus small benevolence is not cruel, but it does not offer sufficient control to destructiveness, which then impels to cruelty. *Cæteris paribus*, large organs have the greatest, and small the least tendency to act—each faculty producing the feeling or idea peculiar to itself. In active constitutions, the brain partakes of the general activity, and comes more readily into play than where the constitution or temperament is lymphatic. Health and disease, exercise and inaction, nutrition and starvation, have also great influence in modifying both the power of the cerebral organs and their readiness to act. Moreover, when certain faculties have been much exercised for a series of generations in a family, they are apt to be manifested in greater strength and activity than where no such hereditary influence exists. Seeing that all the organs tend to action, each, it is concluded, must have a legitimate sphere of action, and be necessary for the welfare of man.

The PROPENSITIES and SENTIMENTS cannot be called into action by the will. We cannot fear, or pity, or love, or be angry, by willing it. But *internal* causes may stimulate the organs, and then, whether we will or not, their emotions will be felt. Again, these feelings are called into action in spite of the will, by the presentation of their *external* objects—cautiousness, by objects of terror, love, by beauty, and so on. The excitability of the feelings, whether stimulated from within or without, is increased by activity of the temperament. Insanity is a frequent result of over-activity of the propensities and sentiments. These may be diseased and yet the intellect sound. The converse is also true. When an organ is small, its feeling cannot be adequately experienced. The will can *indirectly* excite the propensities and sentiments by setting the intellect to work to find externally, or conceive internally, the proper objects. Lastly, these faculties do not form ideas, but simply feel, and therefore have no memory, conception, or imagination.

The PERCEPTIVE and REFLECTING FACULTIES, or intellect, form ideas, perceive relations, and are subject to, or rather constitute, the will, and minister to the affective faculties. They may be excited by external objects and by internal causes. When excited by the presentation of external objects, these objects are *perceived*, and this *act* is called PERCEPTION. It is the lowest degree of activity of the intellectual faculties; and those who are deficient in a faculty cannot perceive its object.—CONCEPTION also is a mode of action of the faculties, not a faculty itself. It is the activity of the faculties from internal causes; either wilied, or involuntary from natural activity.—IMAGINATION is conception carried to a high pitch of vivacity.—MEMORY, too, is not a faculty, but a mode of action. There is no such thing as the *general* memory of the metaphysicians, but every intellectual faculty has its own memory. Memory differs from conception and imagination in this, that it recollects *real* objects or events which it has actually perceived, and adds the consciousness of time elapsed since they were perceived. The other named modes of action do not require realities or time.—JUDGMENT is, properly, the perception of adaptation, fitness, and necessary consequence; this is a mode of action of the reflecting powers. In a certain sense, the perceptive faculties may each be said to possess judgment; as coloring judges of colors; form, of forms; tune, of music. By the word "judgment," however, is meant right reasoning, sound deciding. To this, a proper balance of the affective faculties is essential. There can be no sound judgment where any of the feelings are excessive.—CONSCIOUSNESS is the knowledge which the mind has of its own existence and operations.—ATTENTION is not a faculty, but the application, or *tension*, of any or all of the intellectual faculties.—ASSOCIATION is the succession of ideas in the mind, each seeming to call up that which succeeds; so that in our waking-hours the mind is never without an idea passing through it. This is a state or condition of the faculties, not a faculty.—PASSION is any faculty in excess: love is the passion of amative-

ness in union with adhesiveness and veneration; avarice, of acquisitiveness; rage, of destructiveness.—PLEASURE and PAIN, JOY and GRIEF, also belong to each faculty, according as it is agreeably or disagreeably affected.—HABIT is the power of doing anything well, acquired by frequently doing it. But before it can be done at all, there must be the faculty to do it, however awkwardly.—TASTE was held by Mr. Stewart to be a faculty, and to be acquired by habit. It seems to be the result of a harmonious action of all the faculties.

Such is an outline of the system propounded by the phrenologists. So far as it shall be confirmed by the mature experience and observation of competent inquirers, the facts and principles which it unfolds must be of great practical value to mankind. The study of the mutual influence of the mind and body has ever been recognized by wise and observant men as one of high importance, though of great difficulty; and certainly Gall and his followers have not only given a strong impulse to that study, but have thrown much light on the diversities of human character, and accumulated a large body of facts of a kind which had previously been too much overlooked. Much, it is admitted, still remains to be discovered. "No phrenologist," says Mr. Combe, "pretends that Gall's discoveries are perfect: they are far from it, even as augmented and elucidated by his followers; but I am humbly of opinion that, in their great outlines, his doctrines are correct representations of natural facts. . . . The future of phrenology will probably exhibit a slow and gradual progress of the opinion that it is true and important; and only after this stage shall have been passed will it be seriously studied as science. Hitherto this has not been done: the number of those who have bestowed on it such an extent of accurate and varied observation and earnest reflection as is indispensable to acquiring a scientific knowledge of chemistry, anatomy, natural philosophy, or any other science, is extremely small; and the real knowledge of it, on the part of such as continue, through the press and in public lectures, to oppose it, appears to me scarcely greater than it was in 1815 and 1826," when it was ridiculed in the *Edinburgh Review*.

In considering the claims of phrenology, two questions should not be confounded. One is—How far the functions of the different parts of the brain have been established by observation of extreme instances of their large and small development?—the other, To what extent the facts so ascertained can be applied physiognomically in practice? Gall disclaimed the ability to distinguish either ill-defined modifications of forms of the skull, or the slighter shades of human character (*Sur les Fonctions du Cerveau*, iii. 41) nor, we believe, did he or Spurzheim ever pretend to estimate the size of *every* organ in a single brain. By attempting too much in these directions some of their disciples may have helped to prolong the incredulity with which phrenology is still widely regarded.

For the titles of numerous books on phrenology, see GALL (F. J.), SPURZHEIM (J. G.), and COMBE (G.); also an article in *The British and Foreign Medical Review*, vol. IX. p. 190. Of other important works bearing on or criticising phrenology, we may mention Dr. Laycock's *Mind and Brain, or the Correlation of Consciousness and Organization* (2 vols., Edin. 1860); his article on phrenology in the 8th ed. of the *Encyc. Brit.*; an article on phrenological ethics in the *Edinburgh Review* for Jan., 1842, vol. lxxiv. p. 376; Aug. Comte's *Philosophie Positive*, tom. iii. (or Miss Martineau's transl., i. 466); sir Benj. C. Brodie's *Psychological Inquiries*, dialogue vi. (Lond. 1854); G. H. Lewes's *Biog. Hist. of Philos.*, p. 629 (Lond. 1857); Samuel Bailey's *Letters on the Philosophy of the Human Mind*, 2d series, letters xvi.–xxi. (Lond. 1858); and Prof. Bain *On the Study of Character, including an Estimate of Phrenology* (Lond. 1861). Sir William Hamilton's objections, mostly published many years since, and which are now appended to his *Lectures on Metaphysics*, i. 404 (Edin. 1859), were discussed in the *Phren. Jour.*, vols. iv. and v., and are remarked on by Mr. Combe in his work *On the Relation between Science and Religion*, pref., p. xvii. (Edin. 1857).

PHRYGA'NEA. See CADDICE.

PHRYG'IA, a country in Asia Minor, the extent and boundaries of which varied very much at different periods of ancient history. In pre-historic ages it is believed to have comprised the greater part of the peninsula; but at the time of the Persian invasion it was limited to the districts known as Lesser Phrygia and Greater Phrygia—the former stretching from the Hellespont to Troas (inclusive), the latter occupying a central portion of Asia Minor. The inland boundaries of Lesser Phrygia are not well ascertained; but Greater Phrygia was bounded on the n. by Bithynia and Paphlagonia, on the e. by Cappadocia and Lycaonia, on the s. by the Taurus range, and on the w. by the maritime countries of Mysia, Lydia, and Caria. At a later period it was considerably reduced by the formation of Galatia (q.v.) and the extension of Lycaonia. Phrygia was in general a high and somewhat barren plateau, though its pastures supported immense flocks of sheep, noted for the fineness of their wool, as indeed they still are. The most fertile part was the valley of the Sangarius, but the most beautiful and populous district was the s.w., at the base of the Taurus, where the Mæander and other streams had their rise. The mountains and streams yielded gold; Phrygian marble was anciently celebrated, and the cultivation of the vine appears to have been extensively carried on.

The origin of the Phrygians is one of the mysteries of ancient ethnology. Some think that they were settled at a very remote period in Europe, and that they emigrated from Thrace into Asia Minor; and Xanthus, Herodotus, and Strabo certainly speak of

such a migration. Xanthus places it after the Trojan war; but if there be any truth in the tradition at all, it can only refer to a return of some tribes to the cradle of the race in the valley of the Sangarius, for the Phrygians were regarded as one of the oldest races (if not the very oldest) in Asia Minor. Instead of seeking for their origin in Thrace, the best classical ethnologists seek for it in the neighboring highlands of Armenia, whence the Phrygians are believed to have spread, at a period far before the dawn of authentic history, over the greater part of the peninsula, and thence to have crossed into Europe, and occupied the greater part of Thrace, Macedonia, and Illyria; while the mythic Pelops, who colonized the Peloponnesus, and gave it his name, was said by tradition to be a Phrygian. In both Greek and Latin poetry the Trojans are also called Phrygians, and the same name is applied to other nations of Asia Minor, such as the Mydonians and Mysians. In Thrace, too, many of the names of places were the same as in Troas; while it has now been demonstrated that the Armenian, Phrygian, and Greek languages are akin to each other, so that the people speaking the two former tongues, like those speaking the latter, belong to the great Aryan branch of the human family. The Phrygians began to decline in power and numbers after the Trojan war. They were—if we can make anything like historic fact out of the mythic narratives of that early time—pushed out of Europe by the Illyrians in the north and the Macedonians in the south, while in Asia Minor the rise of the Semitic Assyrians also depressed and weakened them by breaking up the integrity of their territory. The whole of the s. coast of the peninsula was occupied by Semitic invaders; the Lydians and Cappadocians were of Syro-Phenician origin; and Strabo speaks of structures of Semiramis as far n. as Pontus. Their language, manners, and religion even, underwent radical changes—hence the great difficulty experienced in ascertaining their original characteristics. After being subjugated by Crœsus they passed, on the dissolution of the Lydian monarchy, under the sway of Cyrus; and it is only from this date that they are brought within the pale of positive history. Their country formed part of the empire of Alexander, and subsequently belonged to the Syrian Seleucidæ, to the kings of Pergamum, and to the Romans, who obtained possession of it 133 B.C.

The Phrygians had not a warlike reputation among the ancients; but though in later times commonly described as indolent and stupid, yet, like negroes, they were of a mystic and excitable disposition. Their religious orgies, accompanied by wild music and dancing, are frequently mentioned by classic writers, and appear to have exercised a very material influence on Hellenic worship. Cybele, "the great mother of the gods," was the chief Phrygian divinity; others were Sabazius (Dionysus), Olympus, Hyagnis, Lityerses, and Marsyas.

PHRY'NÉ, one of the most celebrated courtesans of antiquity, was the daughter of Epicles, and was born at Thespiæ in Bœotia. Her position in life was originally very humble, and she is said to have at one time earned a livelihood by gathering capers; but, as the fame of her marvelous beauty spread, she obtained numerous lovers, who lavished gifts on her so profusely that she became enormously rich. In proof of this, the story goes that she offered to rebuild the walls of Thebes, if the citizens would allow her to place this inscription on them: "Alexander destroyed them; Phryné, the courtesan, rebuilt them." The Thebans declined the proposal. Her enemies accused her of profaning the Eleusinian mysteries. Summoned before the tribunal of the Heliasts, she was defended by the rhetorician Hyperides, one of her lovers, who, perceiving that his eloquence failed to convince the judges, threw back her veil, and displayed her naked shoulders and bosom. She was immediately acquitted, and carried in triumph to the temple of Venus. The famous picture of Apelles (q.v.)—the "Venus Anadyomene"—is said to have been a representation of Phryné. Praxiteles, also a lover of hers, employed her as a model for his "Cnidian Venus."

PHTHALIC ACID. See NAPHTHALIC GROUP.

PHTHIOTIS, in ancient geography, the s. part of Thessaly, from the Narthacian mountains on the n. to the Maliac gulf on the s., and from the Pagasæan gulf on the e. to Dolopia on the west. Its inhabitants were Achæans, and their most important towns were Larissa, Haluc Itonus, and Thebæ. The name comes from the Homeric Phthia, which included, however, a much larger portion of Thessaly. Part of the ancient Phthiotis constitutes the modern eparchy of the same name.

PHTHI'SIS. See CONSUMPTION.

PHULOW'DI, a t. of India, in the Rajpoot state of Jodhpoor, in lat. 27° 8′ n., and long. 72° 28′ east. It is built on a rising ground, near the bank of a stream, which, after a course of no great length, loses itself amidst the sands of the desert. Pop. about 15,000.

PHULWARA TREE. See BASSIA.

PHYCOL'OGY. See ALGÆ.

PHYLAC'TERY (from Gr. *phylasso*, to guard), an amulet or charm worn by the Greeks against demoniac influences. Certain strips of parchment, inscribed with certain passages from the Scripture (Exodus xiii. 1–10, 11–16; Deuteronomy vi. 4–9, xi. 13–21), inclosed in small cases, and fastened to the forehead and the left arm (*tefillin*)—also, in another form, to door-posts (*mesusah*)—in use with the Jews, in imagined accordance with Exo-

dus xiii. 9–16, etc., are also called in the New Testament phylacteries. The writing of these is in the hands of privileged scribes (*soferim*) only, and many and scrupulous are the ordinances which they have to follow in the execution of this task. Only vellum of a very superior kind is to be used; the characters must be traced with the greatest care; no erasures or corrections are allowed; the lines and letters must be of equal length, etc. The case in which they are inclosed consists of several layers of calfskin or parchment. It may be observed, by the way, that not the wearing, but the exaggerated form of the phylacteries worn by some of the Pharisees, is inveighed against by Christ.

PHYLÆ, a Greek word, meaning tribes, applied specially to the divisions of Attica, originally four, but made ten by Cleisthenes after the Pisistratidæ were driven from Athens. The number was still later raised to twelve. Each *phyle* had a leader, or phylarch, who possessed certain authority, both of a civil and military nature, and each tribe sent 50 representatives to the Athenian senate. In time the civil duties, such as presiding over the assemblies, were taken from the phylarch and given to an officer called the epimeletes.

PHYLLOSO'MA. See Glass-crabs.

PHYLLOSTOM'IDÆ, a family of insectivorous bats (formerly classed only as a genus), comprising the vampire bat (q.v.). As their name indicates, they are distinguished by certain leaf-like nasal appendages. They are all of large size, and are natives of the Pacific region of North and South America.

PHYLLOXE'RA (Gr. *phyllon*, a leaf, and *xeros*, dry), a genus of insects of the order *hemiptera*, sub-order *homoptera*, the type of a family, *phylloxeridæ*, allied to the *aphis* (q.v.) and *coccus* (q.v.) families. The *phylloxeridæ* attach themselves to various plants, on the juice of which they feed, and which they often injure or destroy. *P. vastatrix* is the name given to an insect of this family which, since 1865, has committed great devastation in the vineyards of France, and seems to have been imported from North America. Great numbers of this insect appear on the roots of the vine, and their puncturings are so numerous and incessant that the roots can no longer supply nutriment to the plant, which accordingly fades and dies. The *P. vastatrix* has also been observed on the leaves of the vine. It measures, when fully grown, only about $\frac{1}{88}$ of an inch in length. It is provided with a long, slender proboscis, which lies in a groove in its under side. Yellow in summer, it becomes brown at the end of autumn. Another variety, the Oak Phylloxera (*P. quercus*), appears on the leaves of oak trees.

PHYSA'LIA, a genus of *acalephæ*, having an oval or oblong body, which consists in great part of an air sac, so that the creature floats on the surface of the sea, with numerous appendages of various kinds hanging from its under side. The shorter of these appendages are suckers, which are kept in constant motion for procuring prey, and which seem also to be employed in extracting nutriment from it, as the physalia has no proper mouth nor alimentary canal. Among these shorter appendages, also, some seem to be devoted to the purpose of reproduction by germination. The longer appendages, which are extremely long—those of a physalia 5 or 6 in. in length being capable of extension to 12 or 18 ft.—are rope-like tentacles, possessing a remarkable stinging power, which is probably used for benumbing prey. It is a common trick with sailors to make a novice pick up a physalia, the beautiful colors of which always attract admiration. The stinging power is, however, such as not merely to produce local pain, but constitutional irritation. It was at one time supposed that the physalia has the power of expelling air from its bladder, and sinking at pleasure in the sea; but the observations of Mr. Bennett (*Gatherings of a Naturalist in Australia*) render it more probable that it always floats on the surface, and is driven about by the winds. The name *Portuguese man-of-war* is often popularly given to the species of physalia, and particularly to *P. pelagica*. The *physaliæ* inhabit the seas of warm latitudes, but shoals of them are occasionally driven to the British coasts.

PHY'SALIS, a genus of plants of the natural order *solanaceæ*, remarkable for the calyx, which becomes large and inflated after flowering is over, and incloses the ripened berry. The species are annual and perennial herbaceous plants and shrubs, natives of temperate and warm climates, and widely scattered over the world. The Common Winter Cherry (*P. alkekengi*) is a perennial, native of the south of Europe and great part of Asia, growing in vineyards and bushy places. It is not a native of Britain, but is pretty frequent in flower-gardens. The berries have a sweetish subacid taste; they are seldom eaten in Britain, but very generally in many parts of the continent of Europe. They are refrigerant and diuretic, and were formerly employed in medicine on account of these properties. The Downy Winter Cherry, or Peruvian Gooseberry (*P. pubescens.*or *P. Peruviana*), is an annual American species, densely clothed with down; with heart-shaped leaves, yellow flowers, and yellowish berries, which are eatable.

PHYSE'TER. See Cachelot.

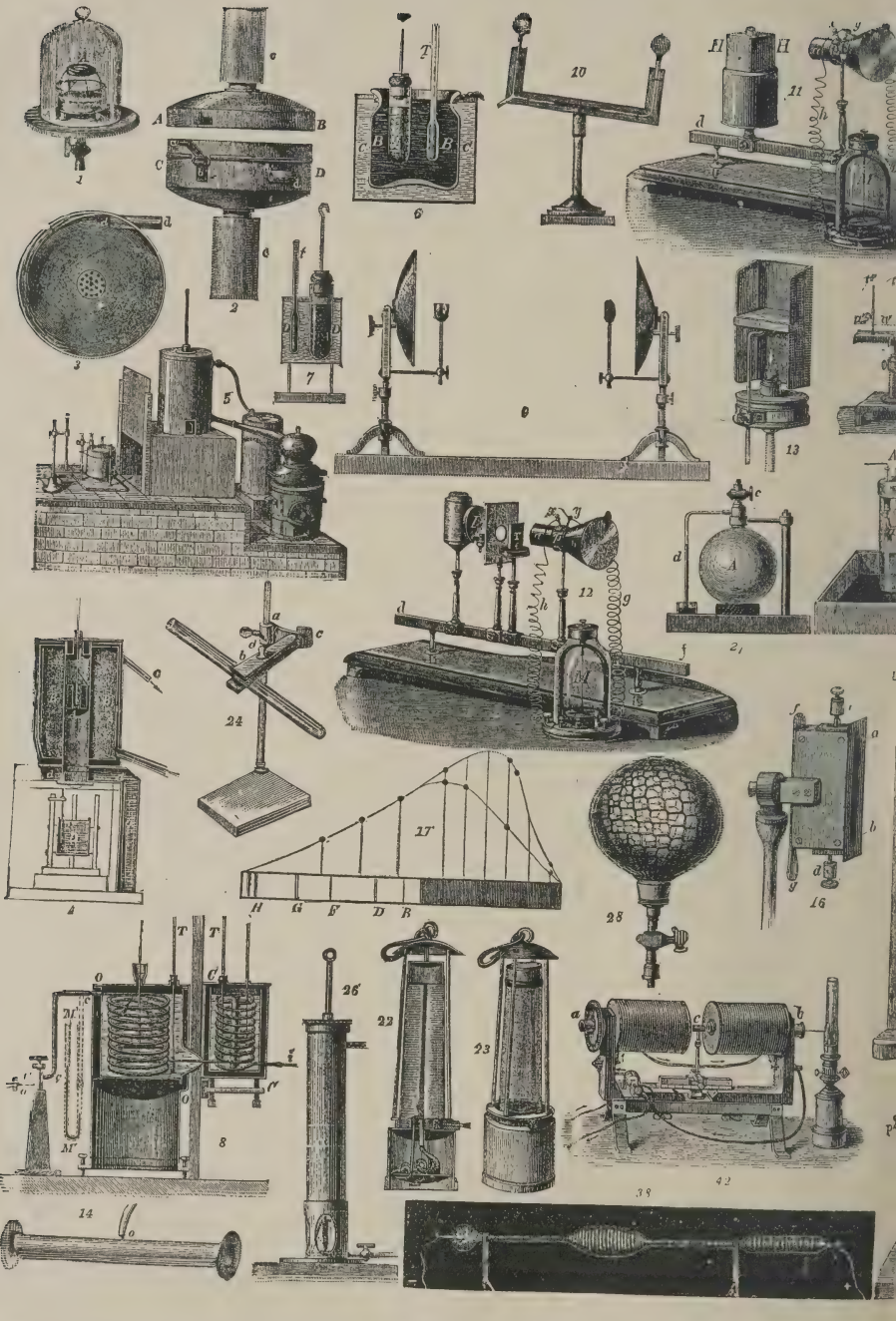
PHYSICAL GEOGRAPHY. See Geography.

PHYSICIANS. See Medical Practitioners, in law; Medicine, History of

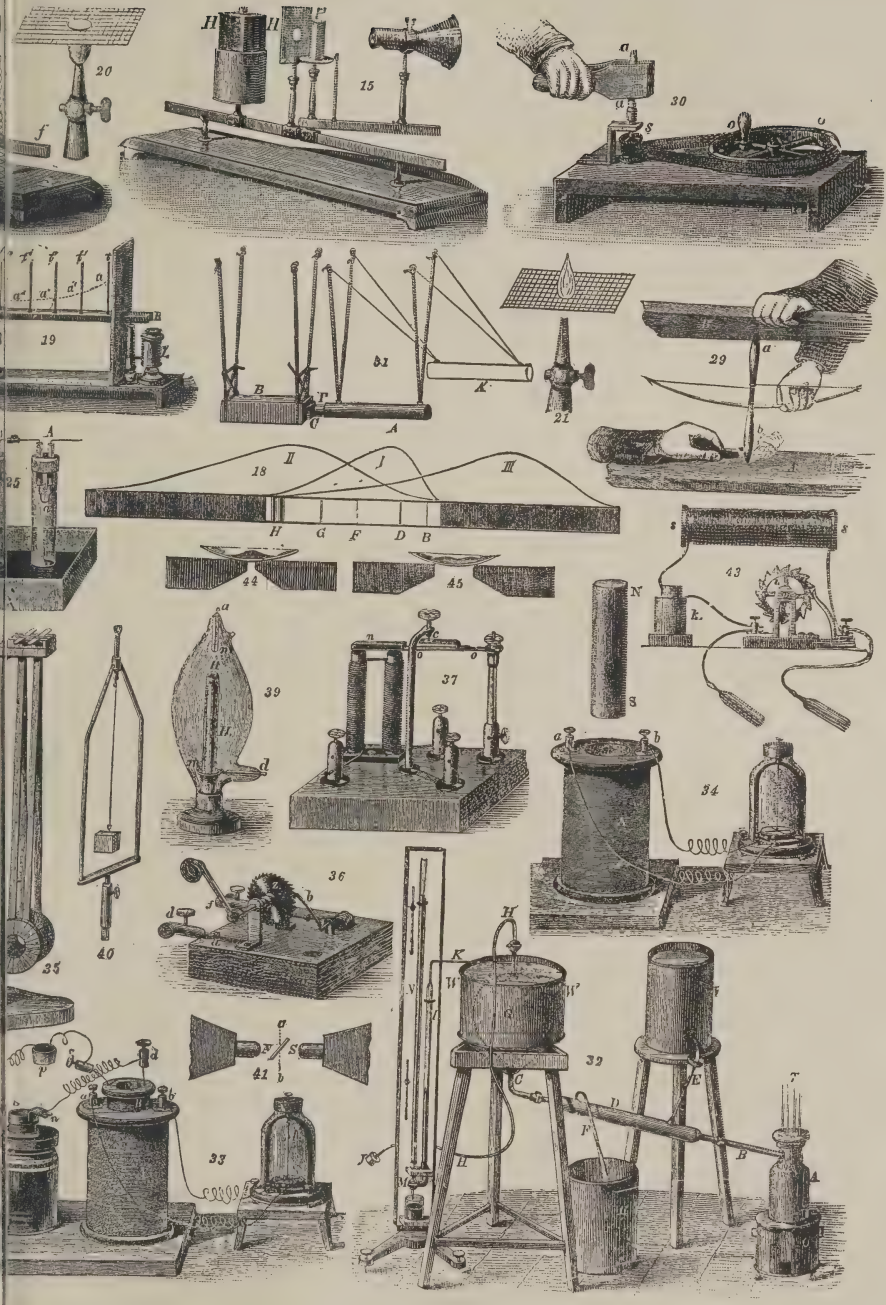
PHYSICIANS, The Royal College of (of London), was founded in 1518 by the munificence of Thomas Linacre, a priest and distinguished physician, who was born in 1460, and died in 1524. In 1518, through the influence of cardinal Wolsey, he obtained from Henry VIII. letters-patent granting to John Chambre, himself, and Ferdinandus de Victoria, the acknowledged physicians to the king, together with Nicholas Halsewell, John Francis, Robert Yaxley, and all other men of the same faculty in London, to be incorporated as one body and perpetual community or college. They were permitted to hold assemblies, and to make statutes and ordinances for the government and correction of the college, and of all who exercised the same faculty in London and within seven miles thereof, with an interdiction from practice to any individual unless previously licensed by the president and college. Linacre was the first president, and held the office till his death in 1524. The meetings of the college were held at his house in Knightrider street, which he bequeathed to the college, and which, until the year 1860, continued in the possession of that body. About the time of the accession of Charles I., the college, requiring more accommodation, took a house at the bottom of Amen corner, which was subsequently purchased by Dr. Harvey, and in 1649 was given by him to his colleagues. This was the seat of the college till 1666, when it was destroyed by the great fire of London. A new college was then built in Warwick lane, and opened in 1674 under the presidency of Harvey's friend, sir George Ent; and here the meetings were held till 1825, when the present edifice in Pall Mall e. was opened under the presidency of sir Henry Halford.

The reason for forming the incorporation, as set forth in the original charter, is "to check men who profess physic rather from avarice than in good faith, to the damage of credulous people;" and the king (following the example of other nations) founds "a college of the learned men who practice physic in London and within seven miles, in the hope that the ignorant and rash practicers be restrained or punished." The charter further declares that "no one shall exercise the faculty of physic in the said city, or within seven miles, without the college license, under a penalty of £5;" that, in addition to the president, "four censors be elected annually to have correction of physicians in London and seven miles' circuit, and of their medicines, and to punish by fine and imprisonment;" and that "the president and college be exempt from serving on juries." Four years later, in 1522–23, an act was passed confirming the charter, and enacting that "the six persons beforesaid named as principals and first-named of the said commonalty and fellowship, shall choose to them two men of the said commonalty from henceforward to be called and cleaped elects, and that the same elects yearly choose one of them to be president of the said commonalty;" and further directing that, in case of a vacancy by death or otherwise, the surviving elects shall choose successors.

In 1540 an act was passed in which it was declared explicitly that "surgery is a part of physic, and may be practiced by any of the company or fellowship of physicians"—a doctrine which in later times has been totally repudiated by the collegiate body, who, until a few years ago, would not admit to their privileges a member of the Royal college of surgeons, unless he formally resigned his surgical diploma. Other acts were passed in 1553, 1814, and 1858; the last, known as "the medical act," providing for the granting of a new charter to the college, which was obtained in 1862. Finally, in 1860, "an act to amend the medical act" was passed, which repeals the provisions of the act of 1522–23 as to the elects, and declares that the presidency shall in future be an annual office, open to the fellows at large, who shall also be the electing body. As at present constituted, the college consists of fellows, members, licentiates, and extra-licentiates. The *fellows* are elected from members of at least four years' standing, who have distinguished themselves in the practice of medicine, or in the pursuit of medical or general science or literature. The government of the college is vested in the president and fellows only. The present *members* consist of persons who had been admitted, before Feb. 16, 1859, licentiates of the college; of extra-licentiates who have complied with certain conditions; and of persons who have attained the age of 25 years, who do not dispense or supply medicine, and who, after being duly proposed, have satisfied the college "touching their knowledge of medical and general science and literature," and that they have "been engaged in the study of physic during a period of five years, of which four years at least shall have been passed in a medical school recognized by the college." No candidate is admissible if engaged in trade or connected with a druggist's business, or who even practices medicine in partnership with another practitioner, so long as the partnership lasts, or who refuses to publish, when required, the nature and composition of any remedy he makes use of. The *members* are alone eligible for the fellowship. They constitute a portion of the corporation, in so far as they have the use of the library and museum, and the privilege of admission to all lectures; but they do not take any share in the government, or attend or vote at meetings. The examiners for the membership are the president and censors. The *licentiates* are not members of the corporation; they have access to the museum, lectures, and reading-room, but are not allowed to take books away from the library; they may compound and dispense medicines for *patients under their own care,* and in their qualifications very much resemble those who have diplomas both from the college of surgeons and the apothecaries' hall. They must be 21 years of age, and must have been engaged in professional studies for four years before being admitted to examination. The fee for admission as a fellow is 30 guineas,



PHYSICS.—1. Apparatus for congealing water by evaporation. 2, 3. Vessel for reception of so
rors for experiments in radiation of heat. 10. Leslie's differential thermometer. 11, 1
rays of caloric. 14. Absorption of rays of heat by gases. 16. Linear thermo-column.
and thermic influences of the spectrum. 19. Comparative conduction in solids. 2
24. Conduction of heat by water. 25. Conduction of heat by gases. 26. Generation of
of mist by expansion of steam. 29, 30. Generation of heat by friction. 31. Generat
34. Magnetic induction. 35. Attraction and repulsion of parallel currents. 36. Curre
41. Diamagnetic repulsion. 42. Circular polarization by electro-magnets. 43. Induced



carbonic acid. 4 to 8. Apparatus for determination of specific heat. 9. Concave mir-
5. Melloni's apparatus for radiation of caloric. 13. Heated sheet-copper as a source of
. Spectral curve of thermic intensity. 18. Curves of intensity of the chemical, optical
1. Reducing temperature of a flame with wire netting. , 22, 23. Davy's safety-lamp.
t by compressing air. 27. Specific heat of air under constant pressure. 28. Formation
of heat by compressing lead. 32. Tension of aqueous vapor. 33. Induced currents.
reaker. 37. Magnetic hammer. 38, 39. Geissler's tubes. 40. Rotating copper cube.
rrents. 44, 45. Action of the magnetic poles or fluids.

exclusive of stamp-duty; the member's fee is also 30 guineas, and the licentiate's 15 guineas.

The following by-laws of the college should be generally known: 1. No fellow of the college is entitled to sue for professional aid rendered by him. This by-law does not extend to members. 2. No fellow, member, or licentiate of the college is entitled to assume the title of doctor of medicine unless he be a graduate in medicine of a university. 3. No fellow or member of the college shall officiously, or under color of a benevolent purpose, offer medical aid to, or prescribe for, any patient whom he knows to be under the care of another legally qualified medical practitioner.

PHYSICIANS OF **EDINBURGH**, THE ROYAL COLLEGE OF, had its rise in 1617, in an attempt to incorporate the practitioners of medicine, and raise the standard of the profession. King James I. of England looked favorably on the proposal, and granted an order for its establishment; Cromwell in like manner issued a patent in its favor, but both were frustrated by the religious dissensions of the times, and it was not until 1681 that the body became incorporated under a charter from Charles II. A new charter with many important provisions was issued in 1861. To the physicians belongs the honor of having suggested in 1725 the plan of an infirmary in Edinburgh for the sick poor, which has developed into the present magnificent institution. From the first they undertook its medical charge gratuitously. The Royal Edinburgh asylum for the insane at Morningside was also first suggested by them in 1791. The college, which in 1879 had over 160 fellows, possesses a library of upwards of 15,000 volumes; also a valuable and interesting museum of materia medica. An important arrangement was made in 1859 between the Edinburgh college of surgeons and that of the physicians, which had long been on hostile terms, making it competent for the two to combine, in order, by a joint examination, to give a double qualification, embracing medicine and surgery. See SURGEONS OF EDINBURGH, ROYAL COLLEGE OF.

PHYSICK, PHILIP SYNG, 1768–1837; b. Philadelphia; son of an Englishman who had the management of the estates of the Penn family; educated at the Friends' academy, and studied medicine. In 1788 he went to Europe, studied with John Hunter, and was admitted to St. George's hospital to take charge of indoor patients in 1790. In the same year he received a diploma from the Royal college of surgeons in London, and remained with Dr. Hunter, as assistant, for one year. He attended lectures at the university, visited the Royal infirmary at Edinburgh, returning after a year to Philadelphia. In 1793 he was appointed physician to the yellow-fever hospital at Bush Hill; in 1794, one of the surgeons of the Pennsylvania hospital; and the following year, at the recurrence of the epidemic, he was placed once more in charge of the Bush Hill hospital. In 1801–16 he was surgeon at the Philadelphia almshouse infirmary; in 1805, professor of surgery in the university of Pennsylvania; in 1819 called to the chair of anatomy, which he filled until 1831; in 1821, consulting surgeon to the institution for the blind; in 1824, president of the Philadelphia medical society. In 1825 he became a member of the Royal academy of medicine in France; in 1836, honorable fellow of the Royal medical and chirurgical society of London. He contributed valuable papers to the best medical journals of the day, and as a lecturer, theorist, and practical surgeon was held in high esteem.

PHYSIC NUT, *Curcas*, a genus of plants of the natural order *euphorbiaceæ*, having a 5-partite calyx, 5 petals, and 8 to 10 unequal-united stamens. The species are not numerous. They are tropical shrubs or trees, having alternate, stalked, angled, or lobed leaves, and corymbs of flowers on long stalks; and notable for the acrid oil of their seeds. The COMMON PHYSIC NUT of the East Indies (*C. purgans*), now also common in the West Indies and other warm parts of the world, is a small tree or bush, with a milky juice. It is used for fences in many tropical countries, and serves the purpose well, being much branched and of rapid growth. The seeds are not unpleasant to the taste, but abound in a very acrid fixed oil, which makes them powerfully emetic and purgative, or in large doses poisonous. The expressed oil, commonly called *jatropha oil*, is used in medicine like croton oil, although less powerful; it is also used in lamps.—The FRENCH PHYSIC NUT, or SPANISH PHYSIC NUT (*C. multifidus*), a shrub, native of the tropical parts of America, with many-lobed leaves, yields a purgative acrid oil, called *oil of pinhoen*. To this genus belongs the PINONCILLO (*C. lobatus*) of Peru, the seed of which is eaten when roasted, and has an agreeable flavor, although when raw it is a violent purgative. When an incision is made in the stem of this tree, a clear bright liquid flows out, which after some time becomes black and horny. It is a very powerful caustic, and retains this property for years.

PHYSICS, or PHYSICAL SCIENCE (Gr. *physikos*, natural), comprehends in its widest sense all that is classed under the various branches of mixed or applied mathematics, natural philosophy, chemistry, and natural history, which branches include the whole of our knowledge regarding the material universe. In its narrower sense it is equivalent to natural philosophy (q.v.), which, until of late years, was the term more commonly used in Great Britain, and denotes all knowledge of the properties of bodies as bodies, or the science of phenomena unaccompanied by essential change in the objects; while chemistry is concerned with the composition of bodies, and the phenomena accompanied by essential change in the objects; and natural history, in its widest sense, includes all the phenomena of the animal, vegetable, and mineral world. The applica-

tion of the term *physic* to a branch of this last—viz., the science of medicine—is peculiar to the English language.

PHYSIOG'NOMY (Gr.), the art of judging of the character from the external appearance, especially from the countenance. The art is founded upon the belief, which has long and generally prevailed, that there is an intimate connection between the features and expression of the face and the qualities and habits of the mind; and every man is conscious of instinctively drawing conclusions in this way for himself with more or less confidence, and of acting upon them to a certain extent in the affairs of life. Yet the attempt to reach this conclusion by the application of certain rules, and thus to raise the art of reading the human countenance to the dignity of a science, although often made, has never yet been very successful. Comparisons have been instituted for this purpose between the physiognomies of human beings and of species of animals noted for the possession of peculiar qualities, as the wolf, the fox, etc. This was first begun by Della Porta, a Neapolitan, who died in 1615, and was afterwards carried further by Tischbein. The subject of physiognomy was eagerly prosecuted by Thomas Campanella; and when his labors had nearly been forgotten, attention was again strongly attracted to it, although only for a short time, by the writings of Lavater (q.v.).

PHYSIOL'OGY (Gr. *physis*, nature; *logos*, a discourse) is the science which treats of the phenomena which normally present themselves in living beings, of the laws or principles to which they are subject, and of the causes to which they are attributable. It is in short, the *science of life*, and hence the term *biology* (Gr. *bios*, life) has been adopted by some writers in place of physiology. Biology is, however, regarded by some authors (and, we think, correctly) as including in its scope more than physiology, as will be seen from the following extract from Prof. Greene's remarks "on the principles of zoology." "Biology," he observes, "is that branch of scientific inquiry which undertakes to investigate the nature and relations of living bodies. Every living being may be regarded from two points of view, which it is necessary to distinguish clearly from one another. The first of these exhibits to us living beings as possessing definite forms, which, in most instances, are found to be made up of a number of dissimilar parts or *organs;* while the second takes cognizance of the vital actions or *functions* which these organs perform. That department of biology which determines the former is termed *morphology;* that which investigates the latter, *physiology*. Hence the *nature* of living beings is twofold—*morphological* and *physiological*."—*A Manual of the Protozoa*, 1859, pp. 9–10 See BIOLOGY.

PHYTEL'EPHAS. See IVORY, VEGETABLE.

PHYTOLAC'CA, a genus of exogenous plants, of the natural order *phytolaccaceæ*. This order contains about 70 known species, half-shrubby and herbaceous plants, natives of warm parts of Asia, Africa, and America, and is nearly allied to the order *chenopodiaceæ*, from which it is distinguished by the frequently numerous carpels, the corolla-like perianth when the carpel is single, and the stamens either exceed the number of the segments of the perianth, or alternate with them. It is also nearly allied to *polygoneæ*. The genus *phytolacca* has for its fruit a berry with 8 to 10 cells, each cell one-seeded. *P. decandra*, the poke or pocan, a native of North America, now naturalized in some parts of s. of Europe, is sometimes cultivated for its young shoots, which, when blanched, are eaten like asparagus. Yet the leaves are acrid, and the root is an emetic almost or altogether equal to ipecacuanha. The root is also externally applied to cure itch and ringworm. A tincture of the ripe berries, which are fully larger than black currants, and grow in racemes, is efficacious in chronic rheumatism and syphilitic pains. By some it is held to be more valuable than guaiacum. The pulp of the berries is employed in the adulteration of wine.—The young shoots of *P. acinosa* are boiled and eaten in the Himalayas, those of *P. octandra* in Cayenne, and a Chinese species has recently been introduced into British gardens for the same use under the name of *P. esculenta*.

PHYTOL'OGY, another name for botany, not much in use.

PHYTOZO'A (Gr. *phyton*, a plant; *zōon*, an animal), also called *antherozoids*, are minute bodies produced amidst a mucilaginous fluid in the antheridia of many cryptogamous plants (algæ, hepaticæ, mosses, ferns), which are either aquatic or delight in moist situations. In some many-celled antheridia of the higher cryptogamous plants each cell is devoted to the production of a single phytozoon. When the antheridium is mature, and bursts, the phytozoa move for a short time by means of cilia—a provision, apparently, for their reaching the pistillidia, the spores contained in which—according to an opinion rapidly gaining ground among botanists—they are destined to fertilize. Great diversities exist in the phytozoa of different cryptogamous plants. Those which, as lichens, live in dry situations, have no phytozoa.

PI is a printer's term to denote a mass of unsorted types, written also *pie*.

PIACEN'ZA, a city of n. Italy, capital of the province of P., on the right bank of the Po, 2 m. below the confluence of the Trebbia with that river, and 43 m. s.e. of Milan. Beautifully situated on a fine plain, confined on the s. by well-cultivated hills, the city itself is gloomy and desolate in appearance. Its streets are broad and regular—that called the *Stradone* is one of the most beautiful in Italy—but many of them are unfrequented and grass-grown. It contains numerous palaces, and fine churches.

The cathedral, an edifice in the ancient Lombard style, founded in the 11th c., is famous for the richly-curious and grotesque character of its internal decorations, for its numerous sculptures, its paintings, and for a number of frescoes of great grandeur, by Caraccio, Guercino, and others. The church of Sant' Antonio, the original cathedral of Piacenza, was founded in 324 A.D., but has been several times rebuilt. Among the other principal buildings are the palazzo Farnese, founded in 1558, and once a sumptuous edifice, but which has been long in use as a barrack; the palazzo del Commune, and the Collegio dei Mercanti are fine monuments of art. The principal square is the Piazza Cavalli, so called from the colossal bronze equestrian statues of the dukes Alessandro and Rannuccio Farnese. This town occupies by far the most important position in a military point of view, in Italy—a fact which was fully appreciated by those who fortified it with solid walls and a strong castle, which, till 1859, were guarded by the Austrians. On being forced from the city by the war of 1859, the Austrians did not destroy the works, and the Italian government has strengthened and extended them by the formation of externally defended works, and of a formidable intrenched camp, which unites and protects the other works on the right bank of the Po. Manufactures of silks, fustians, linens, hats, etc., are carried on to some extent. The population, which had rather decreased during the previous 10 years, was 37,000 in 1892.

Piacenza, called by the Romans *Placentia*, on account of its pleasing situation, is first mentioned in 219 B.C., when a Roman colony was settled there. In 200 B.C. it was plundered and burned by the Gauls, but rapidly recovered its prosperity, and was long an important military station. Piacenza was the western terminus of the great Æmilian road, which began at Ariminum on the Adriatic. In later history it plays an important part as one of the independent Lombard cities.

PIACENZA, Duke of. See Lebrun, Charles François.

PI'A MA'TER. See Nervous System.

PIA'NA DE' GRE'CI, a t. of Sicily, in the province of Palermo, 10 m. s.s.w. from Palermo, on one of the head-waters of Belici. It was the chief colony of the Albanians who settled in Sicily in the 15th c., taking refuge from Turkish tyranny. Twenty-three such colonies were established in Calabria, but only four in Sicily, where king John II. granted them land, and guaranteed to them the free exercise of their religion. The colony at Piana was founded in 1488. The descendants of the colonists still follow the Greek ritual, and adhere to all the customs of the eastern church, although acknowledging the supremacy of the pope. The Albanian dress is partially retained among the poorer classes, and particularly among the women. The inhabitants of Piana are mostly husbandmen and shepherds. The houses are generally mean buildings of a single story. Pop. 8847.

PIA'NO (Ital. *soft*), abbreviated *p*, is used in music to denote that the strain where the indication occurs is to be played with less than the average intensity of force: *pp*, or *ppp*, for *pianissimo*, signifies very soft, or as soft as possible. In contradistinction from *piano*, *forte*, abbreviated *f*, is used to denote a more than usual force; and *ff*, or *fff*, for *fortissimo*, a still greater degree of force. The gradual transition from *piano* to *forte* is indicated by the sign <; from *forte* to *piano* by the sign >.

PIANO-FORTE (Ital. *piano*, soft, and *forte*, loud) a stringed musical instrument played by keys, developed out of the clavichord and harpsichord (q.v.), from which the piano-forte differs principally in the introduction of hammers, to put the strings in vibration, connected with the keys by a mechanism that enables the player to modify at will the intensity of the sounds; whence the name of the instrument.

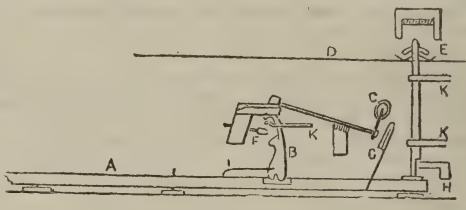
The idea of the piano-forte was conceived independently about the same time by three persons in different parts of Europe—a German organist of the name of Schröter; Marius, a French harpsichord-maker; and Bartolomeo Cristofali, a harpsichord-maker of Padua. Priority in point of invention (1714) is due to the Italian maker. Schröter's discovery was followed up in Germany by Silbermann of Strasburg, Spät of Ratisbon, Stein of Augsburg, and others. The first piano-forte seen in England was made at Rome by father Wood, an English monk there. A few German manufacturers and workmen settling in London, gave an impetus to the new instrument. The English piano-forte has been brought to its present state of perfection by Broadwood, Stodart, Collard, Wornum, Hopkinson, and others. Erard and Petzold made many improvements in France; Germany has long been famous for its pianos; American makers have lately become well known. The compass of the early piano-forte was, like that of the harpsichord, 4 to 5 octaves, and has gradually increased to $6\frac{7}{8}$, or 7 octaves, or occasionally more.

The most natural of the various forms which the instrument assumes is that of the grand piano-forte, derived from the harpsichord, with the strings placed horizontally, and parallel to the keys. The strings are stretched across a compound frame of wood and metal, composed of bars, rods, and strengtheners of various kinds—appliances necessary to resist the enormous tension. This framework includes a wooden sound-board. The mechanism by which hammers are connected with the keys is called the *action* of the instrument. In the earliest piano-fortes, the hammer was raised from below by a button attached to an upright wire fixed on the back-end of the key. The impulse

given to the hammer caused it to strike the string, after which it immediately fell back on the button, leaving the string free to vibrate. This was called the *single action.* As the hammer, when resting on the button with the key pressed down, was thus necessarily at a little distance from the string, the effectual working of this action required that a certain impetus should be communicated to the hammer to enable it to touch the string. Hence it was impossible to play very *piano,* and it was found that if the hammer was adjusted so as to be too close to the string when resting on the button, it was apt not to leave the string till after the blow had been given, thereby deadening the sound. This defect was remedied by a jointed upright piece called the *hopper,* attached to the back end of the key, in place of the wire and button. When the key was pressed down, the hopper, engaging in a notch in the lower side of the hammer, lifted it so close to the hammer, that the lightest possible pressure caused it to strike; and at this moment, when the key was still pressed down, the jointed part of the hopper, coming in contact with a fixed button as it rose, escaped from the notch, and let the hammer fall clear away from the string. To prevent the hammer from rebounding on the string, a projection called the *check* was fixed on the end of the key, which caught the edge of the hammer as it fell, and held it firmly enough to prevent it from rising. A necessary part of the action is the *damper,* which limits the duration of each particular note, so as to cause it to cease to sound as soon as the pressure is removed from the key. It consists of a piece of leather resting on the top of the string, and connected with the back part of the key by a vertical wire. When any key is pressed down, its damper is raised off the string, so as to allow the sound produced to be clear and open; but immediately on the finger being lifted off the key, the damper-wire falls, and the damper again presses on the string, muffling and stopping the vibration. The whole range of dampers may, when required, be raised by the use of the damper pedal, so as to prolong the sound of one note into another.

One further frequent and important addition to the action may be alluded to. In the mechanism above described, the key must rise to its position of rest before the hopper will again engage in the notch of the hammer for another stroke; hence, a note cannot be repeated until time has been allowed for the full rise of the key. The *repetition action* is a contrivance, varying in different instruments, for getting rid of this defect, by holding up the hammer at a certain height while the key is returning.

Great difference of detail exists in the actions of different makers. Some are more complicated than others; but in all are to be found the same essential parts, only modified in shape and arrangement. The subjoined figure represents one of the simplest grand piano-forte actions now in use. A is the key, B the lever which raises the hammer, C the hammer, D the string, and E the damper; F is the button which catches the lever after it has struck the hammer, G the check, H the damper pedal-lifter, I the spring, and K, K, K are rails and sockets.



Formerly the strings of the piano-forte were all of thin wire, now the bass-strings are very thick, and coated with a fine coil of copper-wire; and the thickness, strength, and tension of the strings all diminish from the lower to the upper notes. A grand piano-forte has three strings to each of the upper and middle notes, and now, generally, only two to the lower notes, and one to the lowest octave. When the soft pedal is pressed down the hammers are shifted sideways, so as to strike only two strings instead of three, or one string instead of two.

Besides the grand, the kinds of piano-forte in use are the square, in which the strings are placed still in a horizontal position, but obliquely to the keys; and the upright, in which the strings run vertically from top to bottom of the instrument. The difference in form necessitates alterations in the details of the action, but the general principle is the same.

The piano-forte has in modern times attained a wide-spread popularity beyond that of any other musical instrument. It possesses nearly all the powers of expression of any other instrument; on no other, except the organ, can we execute such complete successions of harmonies; no other represents the orchestra so well, with the advantage that the various parts adapted to it are brought out by the same performer. In all cities of the civilized world there are numerous manufacturers of the piano-forte, employing multitudes of workmen; and even in the secondary towns of Europe the number of makers is daily increasing. In England the manufacturers who have for some time past enjoyed the highest repute are Messrs. Broadwood, Collard & Co., and Erard; but other makers are rapidly approaching them in excellence. Till lately the German makers adopted a much less perfect action than the English, producing a very different touch and tone; but they are now largely using the English action, which is spreading over the continent. Music for the piano-forte is written in two staves, and on the treble and bass clefs. Many of the most eminent musicians have devoted themselves to composing for the piano-forte, and some composers of note, as Hummel, Czerny, Kalkbrenner, Chopin, Thalberg, Liszt,

and Heller, have almost entirely confined themselves to that instrument. See JANKO KEY-BOARD.

The manufacture of pianos in the United States was first undertaken by Jonas Chickering in 1822. Since his time great progress has been made by American manufacturers in perfecting this instrument, especially through the invention of the iron frame and the introduction of the overstrung scale. In 1856 the manufacture of grand pianos was begun by Steinway & Sons, and upright pianos are now made a specialty by a large number of firms. Among American pianos which have made a reputation are those of Chickering, Steinway, Weber, Decker, Steck, Knabe, and Haines; and there are other manufacturers of admirable instruments.

PI'ARISTS, called also familiarly *Scolopini,* or "Brethren of the Pious Schools," a religious congregation for the education of the poor, founded at Rome in the last year of the 16th century. The originator of this institute was a Spanish priest, named Joseph of Calasanza, who, while in Rome, was struck with the imperfect and insufficient character of the education which then prevailed, even for the children of the higher classes, and conceived the idea of organizing a body for the purpose of meeting this want, which the Jesuit society had already partially supplied. The school which he himself, in conjunction with a few friends, opened, rapidly increased in number to 100, and ultimately to 700 pupils; and in 1617 the brethren, who, under the direction of Joseph, had associated themselves for the work, were approved as a religious congregation by Paul V. (q.v.), who entered warmly into this and all other projects of reformation. In 1621 Gregory XV. approved the congregation as a religious order. The constitution of the order was several times modified by successive popes, down to the time of Innocent XI. Its field of operations has, of course, been confined to European countries; and at present it can reckon communities in Italy, Austria, Spain, Hungary, and Poland. In Italy, during the revolutionary wars, the Piarists received into their ranks many members of the suppressed society of the Jesuits. In Spain, their establishments were spared, on the general suppression of religious orders in 1836. In Poland, eleven houses still were in existence in 1832. The number of members in Hungary is said to be about 400, and the order is also found in the German and Slavonic parts of the Austro-Hungarian empire.

PIAS'ABA, or PIACABA, a remarkable vegetable fiber which, during the last 20 years, has become an article of much importance in this country. It is procured from Brazil, chiefly from the ports of Para and Maranham, and is produced by one or more species of palm. That which furnishes the greater part is the coquilla-nut palm (*Attalea funifera*); but Mr. Wallace states that much of it is procured from a species of *Leopoldinia,* which he has named *L. piassaba.* The fiber is produced by the stalks of the large fan-like leaves. When the leaves decay, the petioles or stalks split up into bundles of cylindrical fibers of a dark-brown color, and of a hard texture, varying in thickness from that of a horse-hair up to that of a small crow-quill. This material has been found of great utility in making brushes of a coarse kind, particularly those required to sweep the street; and for this purpose they have almost superseded birch-brooms, split whale-bone brushes, and other similar means for scavengers' work. The coarsest fibers are best for such purposes, and the finer ones are found very valuable for finer kinds of brushes.

PIAS'TER (Gr. and Lat. *emplastron,* a plaster; transferred in the Romanic languages to anything spread out or flattened, a plate, a coin), a Spanish silver coin which has been extensively adopted by other nations. It was formerly divided into 8 silver reals, and hence was termed a *piece of eight,* which name was invariably applied to it by the buccaneers of the Spanish main. The present Spanish piaster, commonly known as the *peso duro, peso fuerte,* or, briefly, *duro,* is the standard of the money system, and is equivalent to about $1.00 of our money. It is divided into 20 copper reals (*reales de vellon*). In the Levant, the piaster is called a *colonnato,* on account of the original coins, which were struck for use in Spanish America, bearing 2 columns on the reverse side.—The Italian piaster, or *scudo,* was an evident imitation of the Spanish coin, and was exactly equal to it in value.—The piaster, peso, or dollar in use in Mexico and Cuba, as well as in Chili, Peru, Uruguay, and other South American states of Spanish origin, have approximately the same value (one dollar). The dollar (q.v.) of the United States of North America was adopted from the Spanish piaster, but is a fraction less in value, owing, it is said, to an error in the original estimate. The coin known as the Turkish piaster is not an imitation, but is an independent national silver coin, which in 1753 was worth about $0.75, but has since gradually and rapidly deteriorated, till at the present day it is equal to not more than 5 cts. of our money.—The Egyptian piaster is worth about five cents. Pieces of 2, 5, 10, and 20 piasters are struck in silver, and of 50 and 100 in gold, the piece of 100 piasters being in Egypt the exchange at par for five dollars.

PIATIGORSK (*Pjätigorsk*), a town in Ciscaucasia, Russia, celebrated for its mineral springs. Though in the center of a bare and uninteresting plain, its situation on the slope of Mashùka, an isolated mountain upwards of 3,000 ft. high, gives it an imposing appearance, and the higher parts of the town command a noble panoramic view of mount Elburz and the more distant Caucasus. The principal bath-houses are well sheltered, and are cleanly and comfortably fitted up. Pop. '89, 13,114.

PIATRA, a t. of Moldavia, Rumania, 64 m. w.s.w. from Jassy, on the left bank of the Bistritza, a branch of the Sereth. The church of Piatra is one of the oldest in Moldavia. The only paper mills in the province are here. Much wood is floated down the Bistritza and the Sereth to the Danube, to be exported from Galatz. Pop. '90, 20,000.

PIATT, a co. in e. central Illinois, drained by the Sangamon river, traversed by the Wabash, the Illinois Central, and other railroads; 440 sq. m.; pop. '90, 17,062, chiefly of American birth. The surface is level. The soil is fertile. The principal productions are corn, wheat, potatoes, and oats. Co. seat, Monticello.

PIATT, Donn, b. Ohio, 1819; educated at St. Xavier college, studied law, was fairly successful in practice, and was judge of a common pleas court. Under President Pierce's administration he was secretary of the Paris legation, and for some months acting *chargé d'affaires*. He enlisted as a private at the outbreak of the civil war, and rose to the rank of col. of volunteers, having served for the greater part of the war as adj.-gen. on Gen. Schenck's staff. After the war he was a newspaper correspondent, founder of the Washington *Capital* and editor *Bedford's Magazine*. He d. in 1891.

PIATT, John James, b. Milton, Ind., 1835; educated at the public schools of Columbus, Ohio, and Kenyon college. His poems were published in the *Louisville Journal*, 1857. In 1859 several productions appeared in the *Atlantic Monthly*. Jointly with William D. Howells, he published, 1860, *Poems by Two Friends; Nests at Washington*, in 1863, the combined work of his wife and himself. Among those written solely by him are *Poems in Sunshine and Firelight* (1866); *Western Windows* (1868); *Landmarks* (1871). He was U. S. consul at Cork, 1882–94; married Sarah Morgan Bryan, b. Lexington, Ky., 1836; author of *A Woman's Poems* (1871), *A Voyage to the Fortunate Isles* (1874), *An Irish Garland* (1885), etc.

PIAUHY, a state in n.e. Brazil, bounded on the n. by the Atlantic, on the e. by the provinces of Ceara and Pernambuco, on the s. by Bahia and Goyaz, and on the n. by Maranhao; 116,218 sq. m.; pop. '90, 202,222. It is bounded on the e. and s. frontiers by mountains, from which the surface slopes down to the Parnahiba river. The other principal rivers are the Piauhy and the Caninde. The surface is mostly a wide grassy plain with little timber. The climate is hot, and in the lowlands unhealthy. The soil is fertile, but agriculture is not much advanced. The chief crops are cotton, tobacco, mandioca, rice, millet, and sugar-cane. Cattle raising is the principal business. Iron, silver, lead and, other minerals are found, but the mines are little worked. The only sea-port is Parnahiba, which has some trade in hides and cotton. Sugar and rum are the chief manufactures. Capital, Therezina.

PIAZ'ZA, or, more fully, Piazza Armerina, a t. of Sicily, in the province of Caltanisetta, 18 m. e.s.e. from Caltanisetta. It stands on the crests and slopes of an isolated hill on the left bank of the Terranova. It is the residence of many nobles and landowners. The chief trade is in corn, oil, fruits, and other agricultural produce. Pop. 17,000.

PIAZZI, Giuseppe, a celebrated astronomer, was b. at Ponte in the Valteline, July 16, 1746. He was received into the order of the Theatins at Milan in 1764; and studied in that city, and subsequently in the houses of the same order at Rome and Turin. Summoned to the professorial chair of philosophy at Genoa, he so alarmed the Dominicans by the freedom and boldness of his opinions that he was removed to Malta, where, in 1770, he became professor of mathematics in the newly-founded university. On the breaking up of this seminary, he returned to Italy, and after teaching philosophy in the nobles' college at Ravenna, he went to Rome, where he became professor of dogmatic theology in the institution of San Andrea della Valle. He was transferred in 1781 to the chair of mathematics in Palermo, where, with the aid of government, he established an observatory, which was put in working order in 1789. The first results of his observations were the rectification of some errors in the estimation of the obliquity of the ecliptic, the aberration of light, the length of the tropical year, and the parallax of various heavenly bodies; these results were published in 1792. Piazzi had now attained a European reputation, which was further heightened by his discovery, on the night of Jan. 1, 1801, of a new planet, the first known of the great group of planetoids between Mars and Jupiter. Piazzi was only able to give a description of it to some of the German and Italian astronomers, when it disappeared; Gauss (q.v.), however, rendered certain the fact of its being a planet. Piazzi named it Ceres, after the ancient goddess of Sicily, to which country he was sincerely attached. In 1803 he published a map of the fixed stars, far superior to any before published, the result of ten years' observations: the work was crowned by the institute of France. In 1814 appeared a new and more complete catalogue (containing 7,646 stars), for which he was again rewarded with a prize from the French institute. He also made researches into the nature of comets, and devoted the later years of his life to the improvement of public education in Sicily. He wrote a number of works, of which, besides the catalogues of stars above mentioned, the *Lezioni Elementari di Astronomia* (Palermo, 1817) is the chief. He also wrote many memoirs for the various scientific societies of Europe. Piazzi died July 22, 1826, at Naples.

PI'BROCH (*piobaireachd*, piping), music played on the bagpipe, which has a wonderful power in exciting the martial instincts and hilarity of the Highlanders. Its rhythm is so irregular, and its notes in the quicker parts so much jumbled together, that a stranger has difficulty in following the modulations or reconciling his ear to them. The earliest mention of the military music of the bagpipe is in 1594, at the battle of Balrinnes; indeed, prior to that period, the bagpipe can hardly be looked on as a national instrument of Scotland. There are appropriate pibrochs belonging to various clans and districts, but some of these may not be older than the beginning of last century. One of the oldest known pibrochs is called the "battle of Harlaw," but it may be doubted whether it was contemporary with that event (1411). In the ballad account of that battle, there is mention of trumpets and horns, but none of the bagpipe; and the pibroch style of music has so obvious a relation to the bagpipe that it is difficult to suppose that it preceded the use of that instrument. According to sir Walter Scott, the connoisseurs in pipe-music affect to discover in a well-composed pibroch the imitative sounds of march, conflict, flight, pursuit, and all the current of a heady fight. Many remarkable instances have been recorded of the effect of the pibroch on the Highlanders. At the battle of Quebec, in April, 1760, whilst the British troops were retreating in confusion, the pipers were ordered to strike up a favorite pibroch, and the result was that the Highlanders, who were broken, rallied the moment that they heard the music, and formed with great alacrity in the rear.

PI'CA. See MAGPIE.

PICA. A morbid appetite for what is unfit or abnormal, as clay, chalk, etc.

PICA. See PRINTING.

PICARD, JEAN, 1620–82, b. France; succeeded Gassendi in 1655, as professor of astronomy in the college of France. In 1666 he became a member of the academy of sciences. In 1671 he went to Uranienborg to determine the latitude and longitude of Tycho Brahe's observatory, and the Paris observatory was founded by his efforts. He was the first to use the modern method of determining the right ascension of the stars by means of a pendulum marking the moment of their meridional passages; and the first to exactly measure a degree of the meridian. He was also the first to use the telescope to measure angles.

PICARDY (PICARDIE), an ancient province in the n. of France, was bounded on the w. by the English channel, and on the e. by Champagne. The name does not occur till the 13th century. The capital of this province was Amiens. The territory now forms the department of *Somme*, and portions of the departments of *Aisne* and *Pas-de-Calais*.

PICCI'NI, OR **PICCIN'NI,** NICOLO, 1728–1800; b. Italy; studied music with Durante and Leo at the conservatory of Sant' Onofrio, Naples. After producing a number of operas at Naples he removed to Rome, where he brought out *Alessandro nell' Indie* (1758); *Cecchina ossia la buona figliuola* (1760), which had an unparalleled success; and *Olimpiade*. In 1776 he went to Paris, where Gluck was then the most popular composer. Marmontel and others championed Piccini, and for several years a bitter controversy was carried on between the "Piccinists" and the "Gluckists." Marmontel made a modern version of Quinault's drama *Roland*, and Piccini composed an opera on it, which had great success. He also composed *Iphigénie en Tauride*, a subject on which Gluck had also written an opera; *Atys*, and many others. He was professor in the *école de chant*, 1783–91, when he was removed, and returned to Naples, where he suffered much annoyance from the espionage of the government on account of his supposed revolutionary sympathies. Returning to Paris in 1798 he succeeded in obtaining from Bonaparte the inspectorship of music at the national conservatory, but he did not live to begin the duties of his office.

PIC'COLO (Ital. *flauto piccolo*, small flute), a flute of small dimensions, having the same compass as the ordinary flute, while the notes all sound an octave higher than their notation. In joyous as well as violent passages this instrument is sometimes very effective in an orchestra.

PICCOLOMI'NI, one of the oldest and most distinguished families of Italy, was originally settled at Rome, but afterwards removed to Siena, and subsequently obtained possession of the duchy of Amalfi. It has produced numerous celebrated *littérateurs* and warriors, one pope (Pius II.), and several cardinals. One of the most distinguished in the history of this family was Ottavio Piccolomini, the first duke of Amalfi, born in 1599, and fifth in direct descent from pope Pius II. He early entered the Spanish military service, and after taking part in the Milanese campaigns, was sent as capt. with a Florentine cavalry regiment to aid Ferdinand II. against the Bohemians. As a cavalry leader he distinguished himself; and from the regiment of cuirassiers under his command issued the death-dealing bullet to Gustavus Adolphus. In 1634 he was placed under the orders of Wallenstein, who took a great fancy to him, and confided to him his secret designs against the emperor; Piccolomini, however, communicated these designs to the emperor, and received, as a reward for his fidelity, a part of Wallenstein's estates. During the remainder of this year he was actively engaged against the Swedes, and greatly distinguished himself in the first battle of Nordlingen. In the following season he was sent with 20,000 troops to aid the Spaniards in the Netherlands, where the French

and Dutch were carrying all before them. Piccolomini speedily drove out the French, but his success against the Dutch was not so marked. He was withdrawn by the emperor in 1640 to stay the Swedes, who, under Baner, were threatening the hereditary possessions of Austria; and his success against these invaders in Bohemia and the Palatinate, though damped by the defeat inflicted on him in Silesia by Torstensohn, induced the king of Spain to entreat the emperor to send him again to the Netherlands to take the command of the Spanish troops. But his success was not nearly so decisive as before, the prestige of the Spanish infantry having been completely destroyed by the great Condé at Rocroi (May 19, 1643). Piccolomini, however, was again successful against both the French and Dutch till 1648, when he was anew summoned to Germany to encounter the victorious Swedes; but after a brief campaign the peace of Westphalia (1648) put an end to his career. He was created a field-marshal by the emperor, and was sent as plenipotentiary to the congress of Nuremberg (1649), and soon after was raised to the high dignity of a prince of the empire. The king of Spain conferred upon him the order of the golden fleece, and bestowed upon him in fief the duchy of Amalfi, which had previously belonged to his family. Piccolomini died at Vienna, Aug. 11, 1656, leaving no children; his son Max, who figures in Schiller's *Wallenstein*, is only a poetical fiction. His fame as a warrior and general is somewhat tarnished by his cruel treatment of a number of Hessian and Luneburger prisoners in 1640.

PICHEGRU, Charles, a French gen., was b. Feb. 16, 1761, at Arbois, in the department of Jura, France. Though of humble parentage he succeeded in gaining admission to the college of his native town, where, and subsequently at Brienne, he received a thorough education. He was specially distinguished in mathematics, and had some thoughts of devoting himself to teaching as a profession; but the advice of Father Perault induced him to enter an artillery regiment in 1783, and he had raisen to the rank of a lieut. when the revolution broke out. Pichegru became an ardent democrat; joined the army of the Rhine, and by his brilliant soldierly qualities soon attracted general attention. In 1793 he became commander-in-chief of the army, and in conjunction with the army of the Moselle under Hoche, repeatedly defeated the Austrians, took from them many important towns, as Gemersheim, Spire, Worms, etc., and established himself in the palatinate; while, after the arrest of his coadjutor Hoche, his success at the head of the combined Rhine and Moselle armies was not less decided. The rapidity and boldness of his maneuvers, when he took the command of the army of the north, in 1794, disconcerted the allies; and before long they were compelled to retreat beyond the Meuse. After a brief respite, Pichegru crossed this river, driving the British before him; and by Feb. 1795, had completed the conquest of the Dutch towns and provinces, ending the campaign by capturing the enemy's fleet (which had been frozen in). He next visited Paris, and while there, suppressed an insurrection of the faubourgs (April 1, 1795); but soon afterward returned to the army, which was now opposed to the Austrians on the western frontier, and for some time displayed his usual skill and energy, crossing the Rhine in the face of the enemy, and capturing Mannheim, the chief fortress, on its banks. But the anarchy which he had found at Paris, combined with the flattering promises and bribes held out to him by the prince of Condé, converted Pichegru into a secret partisan of the Bourbons. His remissness, the unwonted folly and awkwardness of his military maneuvers, though prearranged with the Austrian generals, was not suspected till he suffered himself to be shamefully defeated at Heidelberg, and then retreated, leaving Jourdan (q.v.) without support, thus compelling the latter also to retire. The suspicions of the directory were now aroused, and being confirmed by the seizure of Pichegru's correspondence, he was immediately superseded by Moreau (q.v.), and retired to his native town, where he lived till 1797, when he was elected one of the council of five hundred. He soon became president; but continuing his intrigues with the Bourbons, he was arrested, and subsequently transported to Cayenne. Escaping in June 1798, he made his way to Surinam, whence he sailed for England. He now entered heart and soul into the Bourbon conspiracy along with George Cadoudal (q.v.), the two Polignacs, De Rivière, and others, the primary object being the assassination of the first consul. The conspirators secretly reached Paris, and there Pichegru attempted to persuade Moreau, who was also a royalist, to join with them, but without success. But the plans of the conspirators were soon known to the police; and an intimate friend of Pichegru, with whom he resided, sold the secret of his retreat to the police for 100,000 crowns. Pichegru was surprised in his sleep, and carried off naked to the temple, where he was found dead in his bed on the morning of April 5, 1804. The royalists have endeavored to fasten a charge of private assassination on Napoleon, but it is more generally believed that Pichegru strangled himself.

PICHIN'CHA, an extinct volcano in the west cordillera of the Andes, in Ecuador, about ten miles n.w. of Quito. It is of irregular form, and is 15,218 ft. in height. Around the crater are two other peaks of nearly equal elevation.

PICHLER, Karoline, one of the most eminent novelists of Germany, was born in 1769 at Vienna, where her father, Franz von Greiner, held several legal offices and court dignities. In 1796 she married councilor Andrew Pichler, and published her first work under the title of *Gleichnisse* (Wien, 1800). This was quickly followed by other writings, as the novels *Oliver* (Wien, 1802); *Leonora* (Wien, 1804); *Ruth* (Wien, 1805),

etc.; and the success which attended the appearance of these productions, encouraged her to try a more ambitious line of composition. In 1808 appeared *Agathokles*, which, according to some critics, is the best of her novels. In this work, she endeavored, in opposition to the views expressed by Gibbon, in his *History of the Decline of the Roman Empire*, to depict the ennobling effect of Christianity on the human mind. At the suggestion of Hormayr and other literary friends, who had been struck by the success with which she threw herself into the spirit of the times of which she wrote, she turned her attention to the task of popularizing German history, with the view of fostering a more general feeling of patriotism. Among her best works of this kind, which appeared between 1811 and 1832, and the earlier of which preceded Scott's greatest historical novels, we may instance *Grafen von Hohenberg* (Leip. 1811); *Die Belagerung Wien's von 1683* (Vienna, 1824); *Die Schweden in Prag* (Vienna, 1827); and *Henriette von England* (Vienna, 1832); while of her social novels, the following are among the most popular: *Frauenwürde* (Vienna, 1808); *Die Nebenbuhler* (Vienna, 1821); and *Zeitbilder* (Vienna, 1840). She died at Vienna in 1843. Her dramas were failures, and in her novels there is not a little tedious diffuseness, a remark which applies with equal truth to her autobiography, which appeared at Vienna in 1844 under the title of *Denkwürdigkeiten a. m. Leben*, and formed part of the edition of her collected works, published at Vienna in 1845 in sixty volumes.

PICK'AWAY, a co. in s. central Ohio, drained by the Scioto river and Deer, Darby, and Walnut creeks, traversed by the Norfolk and Western and Cincinnati and Muskingum Valley railroads, and the Ohio canal; about 501 sq. m.; pop. '90, 26,959, chiefly of American birth. The surface is level, and about one-fifth covered with forests. The soil is fertile. The principal productions are wheat, corn, wool, oats, hay, and cattle. Co. seat, Circleville.

PICKENS, a co. in w. Alabama, adjoining Mississippi; drained by the Tombigbee and Sipsey rivers, and Lubbub creek; about 934 sq.m.; pop. 90, 22,470, inclu. colored. The surface is irregular and hilly. The soil is fertile. The principal productions are wheat, corn, cotton, and potatoes. Co. seat, Carrollton.

PICKENS, a co. in n. Georgia, drained by the branches of the Coosawattee and Etowah rivers; about 276 sq.m.; '90, 8182, chiefly of American birth. The surface is uneven and mountainous, much of it covered with forests. The soil in the lowlands is fertile. The principal productions are corn, wheat, cotton, and tobacco. Marble is found. Co. seat, Jasper.

PICKENS, a co. in n.w. South Carolina; adjoining North Carolina; bounded on the n.e. by the Saluda river, and on the s.w. by the Keowee, crossed by the Southern and the Blue Ridge railroads; 464 sq. m.; pop. '90, 16,389, includ. colored. The surface is uneven, and heavily wooded. The Blue Ridge extends along the n. border. The soil is fertile. The principal productions are corn, wheat, cotton, and potatoes. Co. seat, Pickens.

PICKENS, Andrew, 1739–1817; b. Paxton, Penn.; of Huguenot ancestry; removed with his parents to the Waxhaw settlement, S. C., 1752. He fought in the Cherokee war as a volunteer, April, 1761, under Col. Grant, and on his return went to the Long Cane settlement. At the beginning of the revolutionary war he was capt. of a militia company, rising to the rank of brig.-gen. In Feb., 1779, with 400 men under his command, he defeated Col. Boyd, with 700 tories at Kettle Creek. His horse was shot under him at the battle of Stono, 1779. In the same year he defeated the Cherokees at Tomassee. He commanded the militia at the battle of Cowpens (1781), twice rallying them after they had been driven back; and was presented with a sword by congress. In June he captured Augusta, Ga., and while commanding the Carolina militia at the battle of Eutaw, was saved from a fatal wound, by the glancing of the bullet off the buckle of his sword-belt. He conducted another expedition against the Cherokees in 1782, and gained possession of a large portion of the territory now included in the state of Georgia. Soon after the close of the war he was elected to the South Carolina legislature, and represented his district there until 1794; was member of the state constitutional convention, promoted to maj.gen. of militia 1795, member of the legislature 1801 and 1812. He was commissioner on many occasions to treat with the Indians of the south; securing Pendleton and Greenville, S. C. by the treaty of Hopewell; and soon afterward took up his residence at that place. He was prudent, simple in manners, and of great decision of character. He married Rebecca Calhoun, aunt of John C. Calhoun, in 1765. His son Andrew, a lawyer, gov. of South Carolina 1816–18, d. Miss., 1838.

PICKEREL. See Pike.

PICKERING, Charles, 1805–78; b. Penn.; grandson of Timothy. He graduated at Harvard, became a physician, and was naturalist to the U. S. exploring expedition under Commander Wilkes, 1838–42. He afterwards traveled in India and Africa. He published *Races of Men and their Geographical Distribution*, 1848; *Geographical Distribution of Animals and Man*, 1854; and *Geographical Distribution of Plants*, 1861. At the time of his death he had in press *Man's Record of his own Existence*.

PICKERING, Edward Charles; b. Boston, 1846; graduated at the Lawrence scientific school in 1865, and was elected professor of physics in the Massachusetts institute of technology. He was a member of the *Nautical Almanac* expedition which observed the eclipse of 1869. He was elected director of the Harvard observatory in 1876. He published a work on *Physical Manipulation* in 1874.

PICKERING, John, ll.d., 1777–1846; b. Mass.; son of Timothy; graduated at Harvard college in 1796, and became secretary of the U. S. legation at Lisbon the next year. He was private secretary to Rufus King, U. S. minister at London, 1799–1801, when he returned to Salem. He was admitted to the bar in 1804, and practiced at Salem till 1827, when he settled in Boston, where he was city solicitor from 1829. He served in the executive council, and both branches of the state legislature, was on the commission to revise the Massachusetts general statutes in 1833, was president of the American academy of arts and sciences, the founder and first president of the American oriental society, and an overseer of Harvard college. His chief publication was his Greek and English lexicon, 1826, republished abroad. Among his other works are *A Vocabulary of Americanisms*, 1816; *An Essay on a Uniform Orthography for the Indian Languages*, 1820; and *Remarks on the Indian Languages of North America*, 1836.

PICKERING, Timothy, ll.d., 1745–1829; b. Mass.; graduated at Harvard in 1763, and was admitted to the bar in 1768. In 1774 he drew up and presented to Gen. Gage the memorial of the citizens of Salem in regard to the Boston port bill. He belonged to the committee of correspondence, and his arrest was ordered for summoning a town meeting to consider the state of public affairs, but the warrant for his arrest was withdrawn. In 1775 he became a justice of the common pleas for Essex co., and the same year appeared his *Easy Plan of Discipline for a Militia*, which became the authorized manual of the colonial militia. He led an Essex co. regiment of 700 men in 1776, was made adj.gen., was at Brandywine and Germantown, served on the continental board of war in 1777, and was appointed quartermaster gen. in 1780. At the close of the war he went into the commission business in Philadelphia, but removed to Wilkes-Barré in 1786. He settled the territorial disputes between Pennsylvania and the inhabitants of the Wyoming valley, and organized Luzerne co., which he represented in the Pennsylvania convention of 1787 that ratified the federal constitution. Between 1790 and 1793 he negotiated treaties with the Six Nations, and the Indians in the n.w. In 1791 he was appointed postmaster-general; in Jan., 1795, secretary of war; and in December of the same year he was transferred to the state department, from which President Adams removed him in 1800. He again settled on his uncultivated lands; but, a number of his Massachusetts friends having bought a large part of them to secure his return to his native state, he removed to Essex co., of whose court of common pleas he was made chief justice in 1802. In 1803 he filled the unexpired term of Dwight Foster in the U. S. senate, to which he was re-elected in 1805. In 1812 he served on the Massachusetts board of war, and he was a member of congress, 1813–17. In politics he was an extreme federalist, but the warmth of his temper involved him in controversies with some of his political colleagues. He wrote a *Review of the Correspondence between John Adams and William Cunningham*, addresses, etc.

PICKERSGILL, Frederick Richard; b. London, 1820; studied at the Royal academy. His first picture, an oil-painting called "The Combat between Hercules and Achelous," was exhibited in 1840. It was followed by a cartoon of "The Death of King Lear," and by "The Burial of Harold," which was bought for the new houses of parliament. He was elected to the Royal academy in 1857.

PICK'ET, in military language, has several significations. It applies to a stake shod and sometimes ringed with iron, driven into the ground, and used to sustain ropes, which mark off sections in a camping-ground, or for tying horses to. These pickets are 4 or 5 ft. long. Short pickets about 8 in. long are employed as anchors for the ropes extending tents.—In fortification pickets are pointed stakes for pinning gabions together and to the ground; also when pointed at both ends, and laid close together, of different lengths, and in a position inclined towards the front, they form a powerful obstruction to the advance of a storming-party, having a great effect in breaking a line of soldiers.—*Picket* was formerly a military punishment, where the culprit was held by the raised arm in such a position that his whole weight fell on one foot, which was supported on a picket with a blunt point. The time the man thus stood was proportioned to the offense. The punishment became, after a few moments, extremely painful: it has long been discontinued on sanitary grounds.

PICKET is a small body of men posted at some point beyond the general line of the army or corps, for the purpose of observing the motions of an enemy, or giving timely notice in case of any attack. Pickets are either *outlying* or *inlying*.

PICKETT, a co. in n. eastern Tenn., on the Kentucky border, formed 1881 from parts of Overton and Fentress; 240 sq.m.; pop. '90, 47,036. Surface mountainous, with broad intervales along the tributaries of the Wolf and Obey rivers. It is well wooded and has a productive soil yielding grain and fruit. Co. seat, Byrdstown.

PICKETT, George Edward, 1825–75; b. Richmond, Va.; graduated at West Point in 1846; served with credit in the Mexican war, and in 1855 was made capt. in the 9th

infantry. In 1861 he resigned and joined the confederate army as a col., and rose to the rank of maj.gen.; commanded a division at Fredericksburg, Gettysburg, and New Berne. He commanded at the capture of Plymouth, N. C., but met with heavy loss at Five Forks, and surrendered with Lee.

PICKLES. Although the term *pickled* is applied to animal substances, such as beef, pork, fish, etc., preserved in salt, yet pickles are generally understood to be the various parts of vegetables preserved in vinegar. The process employed is first to wash the articles intended for pickles in clean cold water, and afterwards to soak them for a few days in a strong solution of salt in water. They are next taken out, and if fruits or roots, dried in a cloth; but if vegetables, such as cauliflower, etc., they must be well drained, and then placed in the vessels intended to hold them, a few peppercorns, or any other spice which is suitable, being sprinkled in from time to time. When the vessel is so far filled that it will hold no more, boiling vinegar is poured in until it is quite full, and tightly covered up. Many persons prefer to boil the spices, of whatever kind used, in the vinegar; and some add the vinegar cold to such vegetables or fruit as are of a naturally soft substance, because, except in the case of green walnuts, and one or two other fruits, extreme softness is objectionable in pickles. When the materials to be pickled are naturally green, as in the case of gherkins or small cucumbers, French beans, etc., it is considered very desirable to preserve their color as much as possible; and it is sometimes very successfully accomplished by steeping vine, cabbage, spinach, or parsley leaves in the vinegar, by which their color is imparted through the vinegar to the pickles. But this requires great care and patience, more, indeed, than is generally thought worth applying to it, and dealers consequently resort to very reprehensible methods of coloring their pickles, such as boiling the vinegar in copper vessels, and thereby forming an acetate of copper, which is green; or even directly adding that salt to the pickles. Many serious accidents have resulted from the presence of this poison.

The principal pickles made in this country are *cabbage*, almost always made from the red variety ; to this is frequently added slices of beet-root, which are an agreeable addition, and improve the color. The celebrated Spanish pickle is a mixture of the red cabbage and slices of the large Spanish onion. Some housewives, in their efforts to outrival their neighbors, add a little cochineal to improve the color. The spices considered most suitable for pickled cabbage are white and black peppercorns, ginger, and mace.—*Cauliflowers.* Only the flower portion, with its white branches, is used, and in other respects they are treated as cabbage.—*Gherkins*, or very young cucumbers. These require the same spices as the cabbage ; but much care is required to keep as well as possible their green color. This pickle is the one which American cooks and housewives most pride themselves upon making well ; and almost every one has some particular plan for its preparation. A very much approved method is to soak the gherkins in a brine, composed of six ounces of salt to the quart of water for 24 hours, then drain or dry in a cloth, place them in jars, and pour in the pickle, composed of vinegar, with an addition to each quart of one ounce salt, black peppercorns a quarter of an ounce, one ounce of ginger slightly bruised, one or two blades of mace, and a dozen bay-leaves. After soaking two days, they are set on the fire until they simmer, and then replaced in the jars, which must be well corked, and covered with skin, to exclude the air.—*French beans.* The young green pods are prepared in the same way as gherkins.—*Onions and eschalots* are carefully peeled, and, after two days steeping in brine, covered with boiling vinegar, to which the spice, usually black peppercorns, has been added. A small variety of onion, called the silver-skin, is generally used.— *Walnuts.* These are gathered green, and so tender that a pin can easily be pushed through them: they are useless when the shell has begun to form. They require at least a week's steeping in the brine. The vinegar must be poured on them boiling hot. The spices used are peppercorns, mace, ginger, and sometimes a little garlic and cloves.—*Mushrooms* are sometimes pickled only in brine, and are very useful for gravies, etc., in winter-time. They are also preserved in vinegar, and must be washed in salt and water quickly, and then boiled in the vinegar, to which, besides the spices, a small quantity of salt is added.—*Nasturtiums.* The young green fruit or seeds of the nasturtium plant, or greater Indian cress (*Tropæoleum nasturtium*), make a most excellent pickle, which is an admirable substitute for the foreign capers in sauces for various dishes, and alone is an agreeable pickle.—Several kinds of mixed pickles are made, the chief of which is one called *picalilly* or "Indian pickle," which consists of a mixture of cucumber, cauliflowers, etc., with a considerable quantity of mustard-seed, and flour of mustard used as a spice, which gives it a bright yellow color.

Of the foreign pickles imported from other countries, we have the unopened buds of the beautiful plant *capparis spinosa*, called *capers;* olives, pickled both in brine and vinegar, but chiefly in the former—both from southern Europe. From tropical countries every variety of the capsicum—green shoots of bamboo—and the fruit of the mango, which is in much esteem wherever it is known, notwithstanding a turpentine flavor, which is not agreeable at first. Besides these, there are numerous other pickles of less importance, almost every soft part of wholesome vegetables being adapted to this mode of preparation. Pickles generally are considered provocatives to appetite, and if used judiciously, and made properly, are wholesome and agreeable additions to our food.

PI'CO, one of the Azores islands, stands midway between the eastern and western extremities of the group, a few miles s.e. of Fayal. It is 45 m. long, and 5 m. in average width; area about 254 sq.m.; pop.—the descendants of Portuguese—about 24,000. It is traversed by a volcanic ridge, which rises 7,613 ft. high in the peak (Pico), whence the name of the island. See AZORES.

PICO, GIOVANNI, DELLA MIRANDOLA, an Italian philosopher and theologian, whose genius is decidedly inferior to the reputation he once enjoyed, was the son of the sovereign prince of Mirandola and Concordia, and was b. Feb. 24, 1463. At the age of 14 he was sent to the university of Bologna, and after spending some years there, visited the principal schools of Italy and France, everywhere distinguishing himself by the extraordinary facility with which he mastered the most difficult branches of knowledge. His linguistic acquisitions embraced Latin, Greek, Hebrew, Chaldee, and Arabic, besides Italian and French; he was familiar with the different phases of the scholastic philosophy, and he was also versed in mathematics, logic, and physics. At the age of 23 he returned to Rome, when Innocent VIII. was pontiff, and immediately sought an opportunity of showing his learning in the most striking manner, by publicly posting up no fewer than 900 theses or propositions in logic, ethics, physics, mathematics, theology, natural and cabalistic magic, drawn from Latin, Greek, Jewish, and Arabic writers, offering to maintain an argument on each against all the scholars of Europe, and undertaking to pay the expenses of those who came from a distance. Pico presumptuously entitled his theses *De Omni Re Scibili* (On everything that can be Known), and Voltaire sarcastically added, *et de quibusdari aliis*, which addition is as true as it is witty. Pico had several encounters with notable scholars, and is reported to have come off victorious on every occasion. But his very success was the cause of misfortune. The church appointed a committee to report on the propositions of the young prince, and the result was that several of them were condemned as "heretical," although the author was acquitted of any heretical intentions. Pico now withdrew from Rome, and after a short time settled in Florence, where he austerely devoted his whole time to the composition of polemical treatises against Jews and Mohammedans, and to the refutation of judicial astrology. Among his closest friends were Politian and Ficino. He died Nov. 17, 1494, at the early age of 31. A complete edition of his works was published at Bologna in 1496; it has since been frequently reprinted. The principal are *Heptaplus, id est de Dei Creatoris Opere sex Dierum Libri Septem*, an allegorical explanation of creation as recorded in the book of Genesis; *Conclusiones Philosophicæ, Cabalisticæ et Theologicæ*—these are the famous propositions which excited so much ferment at Rome; *Apologia Concordiæ Comitis; Disputationes adversus Astrologiam Divinatricem Libri* xii.; *Aureæ ad Familiares Epistolæ; De Hominis Dignitate.* Pico is a happy illustration of the immediate effects produced in literature by the "revival of letters;" he is full of a specious kind of universal learning, zealous and enthusiastic, but destitute of originality, depth, or creative power. "He was," says M. Matter, "a prodigy of memory, elocution, and dialectics, but neither a writer nor a thinker."

PICOU, HENRY PIERRE; b. France, 1824; studied painting with Delaroche. His most famous works are "The Harvest of Love," 1855; "The First Kiss," 1867; "Moses on the Banks of the Nile," 1870; and "The Night Watch," 1873.

PICRATES. See EXPLOSIVES OF HIGH POWER.

PICRIC ACID. See CARBAZOTIC ACID.

PICROTOX'INE, $C_{15}H_{16}O_6 + H_2O$, is the active principle of *cocculus indicus*, from which it may be extracted by boiling alcohol, or by water containing a little hydrochloric acid. It crystallizes in colorless prisms. This substance is extremely poisonous, one-third of a grain being sufficient, when introduced into the stomach of a cat, to produce tetanic convulsions and death in ten minutes.

PICTOR FABIUS. See FABIUS.

PICTOU, a co. in Nova Scotia, lying upon Northumberland strait; drained by many small streams flowing into the harbors of the coast; 1125 sq. m.; pop. '91, 34,541, the majority of Scotch descent. The surface is undulating and the soil very rich. Iron, limestone, and coal are found. The Pictou branch of the Intercolonial railroad traverses the county. Co. seat, Pictou.

PICTOU', a thriving seaport on the n. coast of Nova Scotia, on the n. shore of an ample and perfectly protected harbor, 113 miles n.n.e. of Halifax. Lat. of light-house, 45° 41′ n.; long. 62° 40′ w. It stands in a fertile and well-cultivated district, with extensive coal-mines and quarries of building-stone in the vicinity. It exports large quantities of coal, also building-stone, dried fish, and potatoes. Commerce is rapidly increasing. The mean summer temperature is 63.52°, and the mean temperature for the year is 42.09°. Pop. '91, 2,998.

PICTS, the ancient inhabitants of the north-eastern provinces of Scotland. Everything connected with the history of the Picts has been made matter of controversy, and it is not easy to ascertain the truth, where the information given by early writers is so scanty, and where most modern authors seem only to have looked for materials to support a favorite theory.

It will be unnecessary to enter on an examination of the name itself. The "Picts" of the Romans probably represented a word by which the nation was known in its own language, as well as the barbaric custom to which the well-known expression of Claudian, "nec falso nomine Pictos," bears reference. Of much more importance is the inquiry regarding the origin and language of the Picts. This is what, among Scottish antiquaries, has been emphatically called "the Pictish question;" respecting which the best-known and most amusing, and certainly not the least useful discussion, is that between Jonathan Oldbuck and sir Arthur Wardour, in the sixth chapter of *The Antiquary*. The disputants can hardly even now be said to be agreed; but the prevailing opinion is, what sound criticism always pointed to, that the Picts were a Celtic race—perhaps the first known inhabitants of northern Britain, and (as some hold) to be identified with the Caledonians of the Roman writers. At the time when they became generally spoken of under the name of Picts, they occupied the whole territory n. of the firth of Forth, except the western portion, which had been colonized or subdued by the Scots, another Celtic nation, whose chief seat was in Ireland—the proper and ancient Scotland. The southern boundary of the Picts was the Roman province of Valentia, embracing the territory between the two Roman walls. At a later period, when Britain was abandoned by its imperial rulers, the boundaries of the various nations occupying the northern part of the island may be traced with considerable distinctness. Making allowance for partial changes at various times, these boundaries may be held to be the following: The Pictish territory extended along the whole sea-coast from the firth of Forth to the Pentland firth. It was bounded on the w. by the country of the Scots, which extended along the western coast from the firth of Clyde to the modern Ross-shire; but the precise line between the two nations cannot be ascertained. The country of the Picts was bounded on the s. by the firth of Forth and the province of Lothian, then possessed by the English; while the country of the Scots had for its southern boundaries the firth of Clyde and the kingdom of Cumbria, held by the independent Britons.

The Pictish nation consisted of two great divisions, called the northern and the southern Picts, the boundary between them being the mountain range known afterwards as the Grampians. These divisions seem at some times to have been ruled by different princes, at other times to have been under one sovereign. The Picts were converted to Christianity at different periods. The southern Picts received the faith from St. Ninian, bishop of Candida Casa, early in the 5th century. This is mentioned by Bede, and the fact itself has never been doubted; but controversy, as usual, has been busy with the details. The point in dispute is the situation of the Picts who owed their conversion to Ninian (q.v.). A careful examination of the statements of venerable Bede, and the fuller but less trustworthy narrative of Ailred of Rievaux, will show that the southern Picts, converted by Ninian, had their seat north of the Forth; that they were, in fact, the great division of the Pictish nation occupying the country between the firth and the Grampians. The labors of Ninian were carried on and completed by teachers whose names are well known to the readers of ecclesiastical history—Palladius, Serf, Ternan, and others. The northern Picts owed their conversion to a teacher of higher renown—St. Columba (q.v.). The life of that abbot, from his leaving Ireland in 563, to his death in 597, was chiefly spent in converting the northern Picts. Their ruler at this time was Brude, son of Mailcon, whom Bede styles a very powerful king. His chief residence was on the banks of the Ness, and there Columba baffled and confuted the heathen Magi in the manner recorded by his biographer Adamnan. It is impossible to ascertain the precise character of the superstitions held by the Picts before their conversion. Those whom Adamnan calls Magi, are by some modern writers styled Druids, and their religion is said to have been a species of Druidism—whatever that may be held to mean.

Brude, the first Christian king of the Picts, died in 586. Catalogues are preserved, of more or less authority, of the sovereigns who succeeded him. It is impossible to reconcile the discrepancies of these lists, which probably contain the names of princes who reigned at the same time in the northern and southern divisions of the kingdom. The limits of the Pictish territories continued much the same till the middle of the 7th c., when a portion of the southern province was subdued by Oswy, king of Northumbria. In the beginning of the reign of Oswy's son and successor, Egfrid, the Picts made an attempt to recover the territory which had been wrested from them. It was unsuccessful; and the power of the English was so firmly established, that the conquered province was erected into a diocese separate from Lindisfarne, the seat of the bishop being fixed at Abercorn. Encouraged by the success which had attended his enterprises, Egfrid seems to have contemplated the subjugation of the whole Pictish kingdom. He advanced northwards with his army; Brude, son of Bili, king of the Picts, retreating before him. The English sovereign passed the Tay, and the Picts made a stand at Nechtansmere, supposed to be Dunnichen, in Angus. A conflict ensued; the English were utterly defeated, and their king was slain. The consequences of this battle, which was fought on the 20th of May, 685, were very important. The Picts recovered the whole territory which they had lost, and even subdued for a time a portion of the proper Northumbrian kingdom.

The next Pictish prince whose name calls for special notice is Nectan, son of Dereli, who succeeded about the year 710. He cultivated learning to some extent, and aspired

to the position of an ecclesiastical reformer. The Pictish church held precisely the same doctrines as the English; but it differed in various points of ritual, the most important of which related to the proper time of keeping easter. The king applied for advice to Ceolfrid, abbot of Jarrow, and the answer, which is addressed "To the most excellent lord, and most glorious king, Nectan," is preserved among the works of venerable Bede. Encouraged by this epistle, he summoned a counsel of his clergy and nobles, and enjoined them to observe the English usages. The royal command met with a ready obedience. He had also applied to the abbot of Jarrow for architects to build a church of stone in the Roman fashion, which he proposed to dedicate to St. Peter. We are told by Bede that the architects were sent, but have no further information on this interesting subject. The plans of the king were probably interrupted by dissensions among his people; and the entire assimilation of the ecclesiastical institutions of northern Britain to those of England was postponed for four centuries.

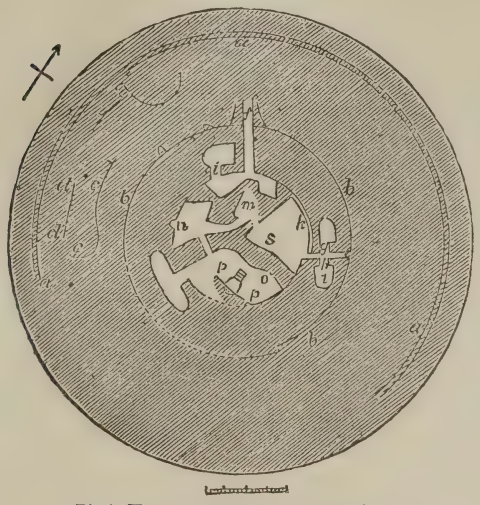
The most active of all the Pictish sovereigns was Hungus, son of Urgust, who succeeded in 730, and reigned for 30 years. He was engaged in constant wars with the Scots, the Britons, and the English, in which he was generally victorious. After his death, the kingdom began to decline. The history of its latest period is involved in impenetrable obscurity; all that we know for certain is the final result. Various princes claimed the crown, and held possession of portions of the kingdom. But the most powerful competitor was Kenneth, son of Alpin, king of the Scots, who was descended, in the female line, from the ancient sovereigns of the Picts, and was probably the true inheritor, according to the peculiar law of succession which is said to have existed among that nation. Kenneth was acknowledged as king in 843, and fixed his residence at Forteviot, in Stratherne, the capital of the Pictish kingdom.

A famous passage from Henry of Huntingdon has often been quoted, in illustration of the supposed utter destruction of the Picts, of their princes, their race, and their language. It is referred to in that sense at the close of the following sentences of a work written some time before, but only published in the year 1864: "The Pictish vessel is seen in the distant horizon; she approaches rapidly, till you clearly distinguish the crew upon the deck; but before you are near enough to hear their voices, she sinks, the waters close over her, and the wreck never can be raised. The total extinction of the Pictish language renders any further inquiry impossible. The acumen and criticism of the 19th c. cannot advance beyond the homely wisdom of the 12th century."—Sir Francis Palgrave's *History of Normandy and England*, vol. iv. p. 294.

The impression conveyed by such words is an erroneous one. The Pictish princes still continued to reign in the persons of Kenneth and his descendants. They were kings of the Picts in reality and by race, as much as James I. and his successors were kings of England. The princes did not cease in the one case more than in the other to be sovereigns of the larger kingdom, because they had previously ruled in the lesser one. Neither did the nation of the Picts cease to exist. They dwelt as before in their own land; their old capital was the capital of the new kingdom; and Pictavia is spoken of by the chronicles long after the accession of Kenneth, and long before Scotia became identified with northern Britain, or ceased to be the ordinary name for Ireland. Undoubtedly, through the influence of the kings, and perhaps of the clergy, whom the later Pictish princes had held under an oppressive bondage, the Scots became the predominant race, and finally gave their name to the united kingdom and nation. Neither did the language of the Picts cease to be spoken. It continued, as before, to be the dialect of the north-eastern provinces, till, first in the extreme n., it yielded to the Scandinavian invader, and afterward—more than two centuries subsequently to the accession of Kenneth—it began to recede slowly before the Teutonic tongue of English and Flemish colonists. The same process which destroyed the Celtic language of the Pictish people, destroyed also the Celtic language of the British kingdom of Cumbria. The subject of the Pictish language has been of late thoroughly discussed by Mr. Skene in his *Four Ancient Books of Wales*. In addition to *Peanfahel*, the sole Pictish word formerly known, Mr. Skene has discovered four other distinct words, besides a number of syllables entering into proper names; and from all these he deduces the opinion that Pictish "is not Welsh, neither is it Gaelic; but it is a Gaelic dialect partaking largely of Welsh forms." More specifically, he holds that Pictish, as compared with Gaelic, was a *low* dialect—that is, different from Gaelic in much the same way that low German differs from high.

The chief ancient authorities for the history of the Picts are Adamnan's *Life of St. Columba*, edited by Dr. Reeves; the *Ecclesiastical History* of venerable Bede; the *Life of St. Ninian*, by Ailred of Rievaux, in Pinkerton's *Ancient Lives of Scottish Saints;* the Pictish chronicle, in the appendix to Innes's *Critical Essay on the Ancient Inhabitants of Scotland*, and in the appendix to Pinkerton's *Inquiry into the History of Scotland;* and the *Irish Annals*, edited by O'Conor. The best modern works on the subject are Innes's *Critical Essay*, and his *Civil and Ecclesiastical History of Scotland;* Pinkerton's *Inquiry;* Chalmer's *Caledonia*, vol. i.; Ritson's *Annals of the Caledonians, Picts, and Scots;* Mr. Grub's *Ecclesiastical History of Scotland*, vol. i.; a dissertation in Garnett's *Philological Essays;* and Mr. W. F. Skene in his *Four Ancient Books of Wales;* and in *Celtic Scotland* (2 vols. 1875–77); Stokes, *On the Linguistic Value of the Irish Annals*, and Rhys, *Celtic Scotland* (1884).

PICTS' HOUSES, a name popularly given in many parts of Scotland to the rude underground buildings, more commonly and accurately called EARTH-HOUSES (q.v.). The name is often given also to a more advanced class of buildings of the same kind, found in the more northern counties of Scotland. The ground-plan of one of these at Kettleburn, in Caithness, explored and described by the late Mr. A. H. Rhind, of Sibster, is figured in the accompanying wood-cut. The outmost circle represents the extreme limits of the mound which covered the structure; *a*, a bounding wall, 3 ft. thick, and 3 ft. high, rudely built of large unshaped stones; *b*, an inner wall, 4 or 5 ft. high; *c* and *d*, fragments of walls faced outward; *e* and *f*, passages leading to the inner chambers; *g*, *h*, and *i*, passages leading to smaller side chambers; *k*, a wall within the wall of the chamber *s*; *m*, a chamber, so ruined that its walls could not be traced all round; *n*, a large boulder, which, being difficult to remove, had been built over; *o*, a chamber containing a regularly built well (between *p* and *p*), 9 ft. deep, and roofed over. The whole walls were built without mortar. The objects found within them were remains of animals and shell-fish, fragments of pottery, and implements of stone, bone, horn, bronze, and iron. The name of Picts' houses is also occasionally given in the n. of Scotland to rude stone structures above ground.



Pict's House at Kettleburn, ground-plan.

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PICTURES, RESTORATION OF. Some important observations on the action of light on oil-paintings have led to a series of experiments by Dr. David Price of the crystal palace, and he has succeeded in demonstrating that the discoloration of pictures in galleries and dwelling-houses arise in a great measure from the presence of sulphide of hydrogen gas, which reduces the metal in the white lead, and thereby gives the dark dingy appearance which so frequently defaces even modern pictures in some places where the pictures are hung on walls not exposed to the direct light of the sun. Dr. Price shows that pictures which have been thus injured can be completely restored by being fully exposed to light in a pure atmosphere, the light exerting a rapid and powerful influence over the lead compounds, even though well protected with varnish. The same holds good even in a stronger degree in water-color paintings in which lead-whites have been used.

PICTURES, RETOUCHING OF. See PHOTOGRAPHY.

PICUMNUS, a Roman god, presiding with his brother, PILUMNUS, over marriage. The art of fertilizing land by means of manure was ascribed to Picumnus.

PICUS, a king of Latium who, according to the Roman fable, was a son of Saturn (q.v.) and gifted with powers of prophecy. He was the father of the woodland divinity Faunus (q.v.), and on refusing to respond to the passion of Circe the enchantress changed him into a woodpecker. See WOODPECKER.

PI'CUS AND PI'CIDÆ. See WOODPECKER.

PIDGIN, or PIGEON, ENGLISH. A "lingo" used in California and in the Pacific ports of Asia, between the Asiatics and mercantile foreigners. "Pidgin" is the word for "business," as it issues from the guttural organs of a Chinaman, as "cumshaw" is that for "commission" or gift. The Chinaman accustomed mainly to monosyllabic speech finds it easy to speak the English words of one syllable, or dissyllables whose ultimates are vowels, or, he will vowelize words ending in hard consonants. For this grotesque form of speech the foreigners rather than natives are responsible, since the former, shrinking from the difficulties of oriental speech, first encouraged the Asiatics to use simple foreign words. Pidgin English, though defying all known grammar, is yet available for every-day use, and is duly taught in classes by Chinese "professors," and

is the daily and only means of communication between tens of thousands of people in China, Japan, and California. This mongrel dialect, as different from Chinese as Chinese is from English, contains Portuguese, Malay, French, and Hindustan elements, besides English; but in many cases one word is used in a great variety of meanings. Prominent in the vocabulary are *sabé* (French, *savoir*, to know), *pecee* (piece), *peggy*, (Malay, go away, take off, etc.) *top-side* (up), etc. Its syntax is usually formed by arranging the words according to the Chinese order. A Japanese lad, in answer to the writer's question, Doko (where?), answered, "Me Yokohama go" (I am going to Yokohama), according to the native idiom, which requires the object first and verb last. Foreigners, in using their own words, transformed into Pidgin English, think them to be native, while the native imagines they are foreign. Though most persons regard this "lingo" as an absurdly silly kind of baby talk, unworthy of adults, and though the tribunals forbid it for testimony, and most printed specimens of it have a comic flavor, yet earnest students recognize in it a new language in embryo, and predict its ultimate status as an accepted tongue, believing that it will be a powerful aid in "westernizing" China, Japan, and India. See Williams, *The Middle Kingdom* (1883).

PIE, a well-known culinary preparation, consisting of a crust of dough or pastry, inclosing either meat or fruit, and baked in the oven. The origin of the word is very obscure. There are two kinds of pies, one in which a dish is used, as in cases where much juice or gravy has to be retained; the other, without the dish. The latter are called raised pies, and a particular kind of paste is required; which is made with hot lard and water, and must have sufficient consistency to stand up. When molded into the form or case of the pie it is filled with meat, usually game, and baked. This kind of crust is not usually eaten with its contents, as it is considered unwholesome; it therefore merely serves as a case for the inclosed viands.

PIEDIMON'TE D' ALI'FÉ, a t. of south Italy, in the province of Caserta, and 37 m. n. by e. from Naples, at the base of the Apennines, on a branch of the Volturno. It is about 3 m. n.e. from Alifé, the ancient *Alifæ*, a city of the Samnites, now a small town of only 2,689 inhabitants. In a grand and gloomy ravine, called the Val d'Inferno, near Piedimonte d' Alifé, a torrent issues from a cavern, which is supposed to derive its waters through subterranean channels from a lake, about 5 m. distant, amongst the mountains. This and other mountain torrents afford water-power for a number of cotton, paper, flour, fulling, and copper mills in and around the town. Piedimonte d' Alifé is one of the most active manufacturing towns in Italy. The extensive cotton-mills established by Mr. Egg give employment to about 1500 hands. There are copper-mines in the vicinity. Pop. 6471, comm., 7252. Piedimonte is the name of several smaller towns and villages in Italy and Sicily.

PIEDMONT, or PIEDMONT (Fr. *pied*, foot, *mont*, mountain), an Italian principality, which now forms the n.w. part of the kingdom of Italy, is inclosed mostly by natural boundaries, having on the n. the Pennine Alps, on the w. the Graian and Cottian Alps, on the s. the Maritime Alps and Genoa, and on the e. the Ticino and the duchy of Parma. It includes the former duchy of Montferrat, which lies in its south-eastern corner, what was the Sardinian portion of the old duchy of Milan, and contains 11,340 English sq. m., with a population (1895) of 3,325,733 (est.). The mountain ranges which form its boundary on the n., w., and s. attain, in various places, a great elevation above the sea; the Col de Tende, Monte Viso, Mont Cenis, Mont Iseran, Mont Blanc, Mont St. Bernard, Mont Cervin, Monte Rosa, and the Simplon being all on the boundary line. As to its general character, the country is partly mountainous, partly hilly, and much diversified with hill and dale; the ranges which traverse the country being spurs from the alpine boundary, and converging towards the central tract, through which flow the Po and its chief tributary, the Tanaro. The valleys which separate these ranges are all watered by rivers which take their rise in the Alps, and pour their supplies into either the Po or the Tanaro, according as they come from the n. and w., or from the s. The amount of the water supply in the country may be imagined when it is considered that in Piedmont the Po receives no fewer than 10 tributaries on the left, and 6 on the right, all of them of considerable size, and some of them, as the Tanaro and Dora Baltea, worthy of being classed as rivers. The valleys of the Po and Tanaro are exceedingly rich and fertile, producing abundant crops of grain, pulse, hemp, chestnuts, olives, and many kinds of fruit. Maize and barley are the chief cereals, the former being the ordinary article of food to the inhabitants, while abundant herds of swine are fed upon the latter. The climate is mild in winter; but in summer, especially on the level country e. of the Dora Baltea and the Tanaro, the heat is scorching, and this portion would be rendered a perfect sandy desert were it not for the complete system of irrigation, which supplies moisture to more than half a million of acres, and renders the eastern districts the granary of the country. So valuable is the privilege of using the water of rivers as a means of irrigation, that a considerable tax is levied upon it. The other products of Piedmont are wine and silk, which are produced in great abundance, especially silk, which is the best in Italy, and is generally exported raw. The chief manufactures are silk, linen, woolen, and cotton goods, hosiery, paper, leather, cutlery, various fermented liquors, glass, and iron. The inhabitants are active and industrious, and mostly belong to the Roman Catholic religion, but are more tolerant than in other parts of

Italy. The Vaudois or Waldenses (q.v.), have from time immemorial inhabited the wild vales at the foot of the Cottian Alps, in the western corner of the principality. Many of the Piedmontese, like the Swiss and Tyrolese, spend their youth and early manhood in traveling through other countries as dealers in engravings, jewelry, and other articles of merchandise, and returning with a small hoard spend the rest of their days in comfort in their native land.

Piedmont, in the 10th c., was possessed by the marquises of Susa, Ivrea, Montferrat, and Saluzzo; and it was not till when, a century afterwards, the marquisate of Susa passed into the house of Savoy, that the latter, then counts of the Maurienne (the s. portion of Savoy), gained a footing in the country. At the commencement of the 12th c. the possessions of the house of Savoy were divided, and the lines of Savoy and Piedmont formed; but they were again united, in 1416, by Amadeus VIII. (afterwards pope Felix V.), who, in the following year obtained from the emperor Sigismund the title of duke of Savoy, which they exchanged for that of king in 1684. During the Spanish war of succession, Piedmont was increased by the addition of the provinces of Alessandria, Valence, Lomellino, and the Val di Sesia (1703), by Tortona and Novara in 1735–36, and by Vigevanase and Bobbio in 1743. In 1796 it was seized by the French and parceled out into six departments, five being incorporated with France, and one with the kingdom of Italy; but after the fall of Napoleon the house of Savoy recovered possession of it. See ITALY, SARDINIA, SAVOY. Since 1860 the name Piedmont, as a provincial designation, has been disused; and Piedmont proper is now divided into the provinces of Alessandria, Coni or Cuneo, Novara, and Turin.

PIE'DRA BLANCA, a t. of the Argentine Republic, South America, in the province of Catamarca, and 6 m. n.n.e. from Catamarca.

PIEGANS, an Indian tribe in Montana. They belong to the Blackfeet, from whom they separated under the leadership of a chief named Piegan, whence their name. In return for the cession of some of their territory, by treaty, in 1868, the U. S. government agreed to pay them $1,000,000. In 1870 Lieut.-Col. Baker led a force against them, and attacked Red Horn's camp on the Marios, killing 173 men, women, and children. The act of congress, April 15, 1874, deprived them of their best hunting grounds. They have suffered greatly from small-pox, but still number over 2,000.

PIER, the block of solid wall between doors, windows, etc.; also a solid mass of masonry built to receive the arch of a bridge. The term is also used synonymously for the pillars (q.v.) of a church; thus, we speak of nave-piers, etc.

PIERCE, a co. in s.e. Georgia; drained by the Satilla and Little Satilla rivers, and Hurricane creek; and traversed by the Savannah, Florida, and Western and the Brunswick and Western railroads; 555 sq. m.; pop. '90, 6379, chiefly of American birth; includ. colored. The surface is level, sandy, and mostly covered by pine forests. Corn, cattle, lumber, and pork are the products. Co. seat, Blackshear.

PIERCE, a co. in n.e. Nebraska, drained by the n. branch of the Elkhorn river; 576 sq.m.; pop. '90, 4864, chiefly of American birth. The surface is level and the soil very rich; corn, oats, wheat, and hay are the chief products. Co. seat, Pierce.

PIERCE, a co. in northern N. Dakota; formed in 1887; 864 sq.m.; pop. '90, 905. It is drained by the Sheyenne river, and is a rich agricultural country. Co. seat, Rugby.

PIERCE, a co. situated in the w. centre of Washington, bounded on the e. by Cascade mountains, and on the w. by Puget sound and Nesqually river; crossed by the Northern Pacific railroad, and drained by the Green and White rivers; 1376 sq.m.; pop. '90, 50,940. The surface is varied by mountains, prairies, and dense forests of fir, cedar, and other trees; the soil is fertile in the valleys; the principal products are grain, wool, hay, and lumber. Mount Rainier, 14,444 ft. high, is in the s. part, and is the highest point of the Cascade range. Co. seat, Tacoma.

PIERCE, a co. in w. Wisconsin, bounded w. and s.w. by the St. Croix and Mississippi rivers; drained also by several smaller streams; 570 sq.m.; pop. '90, 20,385, chiefly of American birth. Lake Pepin is a small but beautiful sheet of water on the Minnesota border. The surface is partly prairie and partly hilly. The soil is fertile, and produces wheat, hay, and oats in large quantities. Lumber is the chief export. Limestone is found. Co. seat, Ellsworth.

PIERCE, BENJAMIN, 1757–1839, b. Mass.; entered the revolutionary army soon after the battle of Lexington, took part in the battle of Bunker's Hill, and was made ensign after the battle of Bemis Heights. He obtained the rank of lieut.; remained in the service till the close of the war, and was afterwards appointed brig.gen. of militia. He was in the New Hampshire legislature, 1789–1802, was councilor, 1803–9, and 1814–18; many years high sheriff, and governor, 1827–29.

PIERCE, FRANKLIN, the fourteenth president of the United States of America, was b. in Hillsborough, N. H., Nov. 23, 1804. His father, Gen. Benjamin Pierce, was a soldier of the war of independence, and governor of New Hampshire. Franklin Pierce was educated at Bowdoin college, Maine, and was an officer in a college military company, in which his biographer, Nathaniel Hawthorne, was a private. He spent his first vacation

in teaching a country school, studied law with Levi Woodbury, governor and senator, was admitted to the bar in 1827, became speaker of the state house of representatives in 1829, and was elected to the 33d congress, a democrat of the school of Jackson. In 1837 he was elected to the U. S. senate, of which he was the youngest member. He declined the office of attorney-general, offered him by President Polk, and refused the nomination for governor of New Hampshire; and at the commencement of the Mexican war volunteered as a private, but was appointed brig.gen., and led his brigade in the battles of Contreras and Churubusco. In 1852, in consequence of the conflicting claims of the leaders of the democratic party at the Baltimore convention, he was nominated as a compromise candidate for the presidency, against Gen. Scott, the whig nominee, and received the votes of all but four states. He appointed an able cabinet, including Jefferson Davis as secretary of war. During his administration, the Missouri compromise was repealed; the treaty for reciprocity of trade with the British American colonies was made, and a treaty with Japan; and the Kansas difficulties which then arose, with the growing animosity between the north and south, led to secession, and the war of 1861. At the close of his term of office in 1857 he traveled in Europe, and, having no sympathy with the party which subsequently came into power, he took no part in politics. He d. 1869.

PIERCE, George Foster, d.d.; b. Ga. 1811; graduated at Franklin college in 1829; studied law, but left it for the ministry; joined the Georgia conference of the Methodist Episcopal church in 1831; was pastor of several churches in Georgia until 1837, when he became president of the Georgia College for Women, Macon. In 1848 he was chosen president of Emory college, Georgia, and in 1854 was elected bishop. He was a prominent member of the general conference of 1844 in New York, when measures were adopted for the division of the church. He was an eloquent preacher and an able executive officer. Dr. P. published *Incidents of Western Travel.* He d. 1884.

PIERCE, Henry Niles, d.d., ll.d.; b. Pawtucket, R. I., 1820; graduated at Brown univ., Providence, 1842; ordained priest in the Prot. Epis. church, 1849; engaged in missionary work in the south and west; was consecrated missionary bp. of Arkansas and Indian Territory, 1870. He is the author of *The Agnostic, and other Poems* (1884).

PIERIDES is a name given to the Muses, because their birth-place was in the province of Pieria in Thessaly in the north-eastern part of Greece. Others speak of the Pierides as the daughters of Pieros, King of Emathia, who were defeated in their contest with the Muses.

PIÉROLA, Nicolás de, b. Camaná, Peru, 1839; became a lawyer and journalist; came into prominence first in 1864 as a revolutionist against Spanish aggression; was minister of the treasury under Pres. Balta, and took part in the unsuccessful revolutions of 1872, 1874, and 1876. In the Chile-Peruvian war of 1879 he led another revolt; and was accepted as supreme chief, upon the flight of Pres. Prado. Defeated in the battles of Chorrillos and Miraflores, he fled to the mountains. In 1885 he made an unsuccessful attempt to seize the presidency, and was banished; in 1894 he was an unsuccessful candidate for the office; and in 1895 successfully led another revolt, overthrew President Caceres, and was elected president.

PIERPOINT, Francis Harrison, b. W. Va., 1814; worked in his father's tanyard until the age of 21; graduated at Alleghany college 1841; studied law three years, supporting himself by teaching; commenced practice 1844. He was a thorough abolitionist, vigorously opposed the dogma of state supremacy and secession, and at a convention of the unionists of the state held June, 1861, was unanimously elected provisional governor of the "restored government of Virginia." The president, informed of the rebellion in the state, recognized him as governor, and requested him to raise and commission troops. At the end of 6 months he was elected by the people for two years, and then re-elected for four years. He removed the seat of government to Alexandria, and after the surrender of Lee, transferred it to Richmond in the spring of 1865. In a few months he had completely restored the state government. At the expiration of his term he returned to Fairmont, where he afterward lived.

PIERPONT, John, 1785–1866, b. Conn.; graduated at Yale, studied law at the Litchfield law school and removed to Newburyport, Mass. After unsuccessful business ventures in Boston and Baltimore, he studied theology at the Harvard divinity school, and in 1819 was ordained over the Hollis street Congregational (Unitarian) church in Boston. His advocacy of anti-slavery, temperance, and other reforms, caused his withdrawal from that pastorate in 1845, after which he was pastor of the Unitarian church, Troy, N. Y., and of the first church (Unitarian), Medford, Mass. In the war of the rebellion he was for a time chaplain of a Massachusetts regiment, but resigned to accept an appointment in the U. S. treasury, where he remained till his death. In 1816, he published a poem called *Airs of Palestine;* in 1840 *Airs of Palestine, and Other Poems.*

PIERRE, Jacques Henri Bernardin de St., a celebrated French writer, was b. at Havre, Jan. 19, 1737. He received his education at Caen and Rouen, and afterward entered the government department of civil engineers. On his dismissal from their service in 1761, he wandered about the continent for several years, endeavoring to realize his dream of a republican colony. He returned to France in 1766, and soon after

obtained a commission as engineer for the Mauritius ; but after a residence of three years in the island, he returned to Paris. At this time he wrote the story of *Paul et Virginie*. The little book, with its passion, its simplicity, its tenderness, achieved an immense success, and has been translated into almost every language. St. Pierre passed through the storms of the revolution in safety, and was lucky enough to secure the patronage of Napoleon. He died Jan. 21, 1814. Besides *Paul et Virginie*, he wrote other tales, essays, and several plays

PIERREPONT, EDWARDS, LL.D., b. Conn., 1817; graduated at Yale in 1837; was admitted to the bar 1840; and practiced law in Ohio till 1846, when he returned to New York. He was elected judge of the superior court, New York, 1857, resigned in 1860, and resumed his practice. In 1862 he was chosen by President Lincoln and Gen. Dix, to take charge of the proceedings against prisoners of state, then confined in the forts, on charges relative to the civil war, and in 1867 conducted the case for the government against John H. Surratt, indicted as an accomplice in the murder of President Lincoln. He was appointed district attorney by President Grant in 1869, and resigned a year later. He received the honorary degree of LL.D. from Columbia college in 1871, and from Yale in 1873. He was appointed attorney-general of the United States in 1875, and envoy extraordinary, and minister plenipotentiary, to the court of St. James, which position he resigned in 1877. He was, 1885, consul-general for England at New York. D. 1892.

PIERSON, ABRAHAM, 1641–1707 ; b. Lynn, Mass ; graduated 1668 from Harvard college. His father was the first minister of Newark, and of Southampton, L. I. The son was his colleague at Newark, was afterward pastor of a Congregational church at Killingworth, Conn., 1694–1707; and for the last six years of his life was the first president or rector of Yale college, which then had its seat at Saybrook, though the classes were taught by Mr. Pierson at that part of Killingworth now known as Clinton. A statue of him, rather ideal than a portrait, was executed by Launt Thompson, and now stands on the college green.

PIERSON, WILLIAM, M.D.; 1796–1882 ; b. and d. New Jersey ; graduated at Princeton coll., 1816, and studied medicine in New York and at the univ. of Pennsylvania. He settled in Orange, N. J., where he practised for about 50 years ; was sec. of the state medical soc. for 30 years, and afterward pres.; was a member of the state legislature, 1836–38, and was the first mayor of Orange. He held various positions of trust, and was at one time sheriff of his county.

PIERS PLOWMAN, or rather *The Vision of William concerning Piers the Plowman*, is attributed to William Langland, Longland, or Langelande, b. Cleobury-Mortimer, Shropshire, England, about the middle of the 14th century. He is supposed to have studied at Oxford, and to have been a monk at Malvern. The scene of his poem is laid in the "Malverne hilles" on the Welsh border, and the frequent allusions to the Bible and the fathers, show that its author was an ecclesiastic. The poem which is written in alliterative verse, recounts, the vision of Piers Plowman, who falls asleep beside a stream among the Malvern hills. It contains much vigorous satire of the abuses of society in church and state. It attained a great popularity, and was often imitated by subsequent political and religious reformers. The most notable of these imitations is *Piers Plowman's Creede*, composed about 1390 in the Wycliffite interest. The best edition is that edited by W. W. Skeat for the early English text society, 1867-77. From the forty-three MSS. which remain, it is evident that the poem, originally written about 1362, was repeatedly revised, altered, and extended, and that it continued to occupy the author all his lifetime.

PIETÀ (an Italian word signifying *piety*, in the sense in which that term indicates or includes affection for relatives), the name given in the language of art to representations of the Virgin Mary embracing the dead body of her son. It is a counterpart to the *madonna* with the infant Jesus in her arms, The one affords an opportunity for the representation of the purest joy and highest motherly love; the other, of the utmost pain.

PIETISTS, a designation given since the end of the 17th c. to a religious party in Germany, which, without forming a separate sect, is distinguished not only by certain peculiarities of religious opinion, but also by the manner in which these are manifested. The peculiar character of their religion is very generally denoted by the term *pietism*, which is frequently employed with reference to the same tendencies of opinion, feeling and conduct, wheresoever and whensoever exhibited. Pietism may be regarded as consisting in an exaltation of the importance of religious feeling, and of the practical part of religion, with a corresponding depreciation of doctrinal differences, and a contempt for outward ecclesiastical arrangements; and has been more or less strongly developed from time to time in all sections of the church, a tendency towards it always existing in a large class of earnestly religious minds. In the church of the middle ages, this tendency was displayed in an endeavor to attain to a superior spirituality and purity by means of religious contemplation and asceticism, and many, consequently, embraced a monastic life. The reformers, adopting the Augustinian doctrines, rejected this mode of seeking deliverance from indwelling sin, and proclaimed the efficacy of faith in the sacrifice of Christ. But the controversies which arose among them, and increased among their successors, gradually gave a too exclusively doctrinal and polemical character to the sermons and writings both of the Lutheran and Calvinistic divines, particularly in Germany, and a reac-

tion ensued, not in favor of the church of Rome, but in favor of a religion of feeling and good works, or of the heart and life. Disgust at the sectarian bitterness and exclusiveness which prevailed led even to an undervaluing of disputed points; and thus the *Pietism* of Germany was generated and developed. The origin of it is referred to a work entitled *Vom wahren Christenthume*, by John Arnd, published in 1605; to the *Invitatio Fraternitatis Christi* of John Val. Andreæ, published in 1617, both of them Lutherans; and to the writings of Cocceius, a Calvinist. But its fuller development is unquestionably to be ascribed to Spener (q.v.), in the latter part of the 17th c., and to his friends and disciples. The name *Pietists* was first given in contempt to certain young *docents* in Leipsic, who began in 1689 to give prelections on the New Testament both to students and citizens, and to addict themselves much to a meditative mode of life. Spener had held meetings of a somewhat similar kind in his own house when preacher at Frankfort-on-the-Main, and in his writings had urged the necessity of a reform in the Protestant church and theology. He and his followers dwelt much upon the importance of studying the Scriptures rather than the symbolical books, upon the unfitness of any unconverted or unregenerate person for the office of the ministry, upon the right and duty of the laity to take part in the exercises of Christian assemblies, and upon the necessity of a practical rather than a systematic religion. But many of the more extreme Pietists carried their antipathy to the doctrinalism and the established services of the church to a degree that alarmed the theologians of the old school, the high and dry Lutherans, or German "moderates," who accused Spener and his disciples, not without reason, of a tendency to make all goodness and virtue consist in mere religious feeling, or pious sentimentalism; to represent the divine grace as operating in too sudden and abrupt a manner; to exaggerate the value of good works; to depreciate the value of learning and of clear intellectual perception in the study of Scripture; and to indulge in a strictness of judgment upon the religious character of the ordained clergy, tending to sectarianism, and indeed incompatible with ecclesiastical unity. The weapons of argument, however, were not the only weapons employed against them. The docents were compelled to give up their prelections, and finally to leave Leipsic; the meetings for mutual edification were suppressed by the government as disorderly conventicles; and Francke (q.v.), the most distinguished of the Leipsic docents, having gone to Erfurt, was prevented from lecturing, and quickly compelled to retire. Spener's influence, however, procured a refuge for his friends in the newly founded university of Halle, and Francke obtained a professorship there. Halle became thenceforth the source of new religious influences, and, indeed, of a new religious life to Germany. The Pietists, although spiritually exclusive—disposed to regard themselves as the "chosen of God," and to look down on all others as "children of the world," or even of the devil—did not attempt to form a separate sect. To do them justice, they were as far as possible from being ecclesiastically ambitious; all their desire was to excel in "labors of love," and to cultivate feelings of intensest piety. The rise of the Wolfian or Rationalistic theology, the spread of that sort of skeptical anti-clerical philosophy which flourished for a while under the name of *aufklärung* (enlightenment), exercised an injurious and depressing influence on Pietism; yet through all the long, obstinate warfare maintained against the doctrines of the church by the rationalists during the last half of the 18th, and the most part of the 19th c., Pietism continued to number some adherents; and it can hardly be doubted that it is to the Pietists, and not to the Lutheran dogmatists, that Germany is in a great measure indebted for that revival of religious faith and feeling which, begun with the great Schleiermacher—himself trained up under pietistic influences—has since widely diffused itself through her biblical scholars and theologians. The patriotic enthusiasm called forth by the insolent conquests of the French naturally allied itself to pietistic tendencies, for, in Germany, the triumphs of Napoleon even as *emperor* were looked upon as the triumphs of revolutionary, republican, and infidel principles; and after the general restoration of peace, the statesmen and upper classes, especially in Prussia, believing that political security could only be obtained by a return of the populace to the simple, obedient, and unquestioning piety of earlier times, countenanced this party in the church; and amiable tea-drinking societies of devout men and women were formed to distribute tracts, and to inoculate the radical and heathen masses with pietistic sentiments. But this attempt to use "piety" for reactionary political purposes sullied its purity, and alienated from it the very parties whom it wished to influence. Still, however, Pietism exists as a distinct element in the religious life of Germany, and now, as ever, its strongholds are Prussia (Berlin, Silesia, Wupperthal), Hesse, and Würtemberg.

PIE'TRA-DU'RA, a name given to the finest kinds of Florentine mosaic-work, in which the inlaid materials are hard stones, such as jasper, carnelian, amethyst, agate, etc. The real pietra-dura work dates as far back as the 16th c., about 1570; and from that time to the present has been almost confined to Florence, where a government *atélier* has existed ever since the beginning of the 17th c., which was originated in order to supply decorations for the Capella Medicea. It is sometimes called *Pietre Commesse*, and Lavoro di Commesso. In the inferior kinds, which are sold in Italy, and are manufactured now pretty extensively in Derbyshire and other parts of Britain, pieces of colored sea-shells are used instead of the harder and more valuable colored stones.

PIETRAPER'ZIA, a t. of Sicily, in the province of Caltanisetta, and seven m. s.e. from Caltanisetta, on a lofty height rising from the left bank of the Salso. There are sulphur and gypsum mines in the vicinity. Pop. 11,300.

PIETRASAN'TA, a t. in the province of Lucca, Italy; 15 m. n.n.w. of Lucca, 2 m. from the Mediterranean; pop. abt. 5,000. It is on a hill, on the top of which is a large fortress; it is surrounded by a high wall and entered by three gates, one of them opening near the principal square, on which stands an ancient palace, now used for public offices, and the Pretorio. The streets are wide, well paved and straight, and most of the buildings are in the style of the 14th and 15th centuries. The surrounding country, partly level and partly mountainous, is extremely fertile, and the vine and olive are produced in great abundance. The Serranezza marble is quarried here.

PIEZOM'ETER (Gr. *piezo*, I press; *metron*, a measure), an instrument for measuring the compressibility of fluids. Oersted's (q.v.) instrument, the first by which the compressibility of water was satisfactorily determined, consisted of a cylindrical glass jar, into the neck of which a narrower cylindrical tube of glass, open at both ends, was firmly fixed. In this tube worked an air-tight piston by means of a screw. In the interior of the jar was placed a bottle, whose neck was drawn out into a long capillary graduated tube, and along side this bottle was suspended a cylindrical tube, closed at the top, but open at the bottom. When the compressibility of any liquid was to be determined, the instrument was adjusted in the following manner: the bottle inside was filled almost to the top of the capillary tube with the fluid, and being replaced inside the jar, the latter was completely filled with water up to the piston in the neck. The liquid in the submerged bottle, then under pressure of the water above it, fell slightly in the capillary tube, being kept from contact with the water by an air-bubble, the motion of which up or down, according as the pressure was less or greater, served as an index for reading off the graduation. The suspended tube alongside being at first only filled with air, the water rose in it to some extent, and by graduations on the tube it was made to indicate the pressure in atmospheres or parts of atmospheres. Pressure was now applied to the water in the jar by screwing down the piston; the compressed water communicated the pressure to the liquid in the bottle and to the air in the suspended tube; the descent of the air-bubble in the former indicating the amount of diminution in bulk the liquid had undergone (the capillary tube being graduated in inches and parts of inches, and each inch of tube being known to contain a certain fraction of the contents of the bottle), while the ascent of the water in the suspended tube showed the amount of pressure which had been applied.

PIG. See Hog.

PIGEON (Ital. *pigione*, *piccione*, or *pipione*, from *pipiare*, Lat. *pipire*, to peep or cheep), a name sometimes applied, like dove (q.v.), to all the species of *columbidæ* (q.v.), and sometimes almost restricted to those still included by ornithologists in the genus *columba*; having a bill of moderate length, hard, and a little arched at the point, the base of the upper mandible covered with a soft thick skin, in which the nostrils are pierced; the feet with toes divided to the base, and formed both for walking and perching; the wings rather large and pointed; the tail of moderate length, and generally square at the end. The species of this group are numerous, and occur in almost all parts of the world. Some of them build their nests in trees, and some in holes of rocks; they lay only 2 eggs at a time, but breed twice or oftener in a year, and both the male and the female take part in incubation. The original of all the varieties of the Domestic Pigeon is now almost universally believed to be the Rock Pigeon or Rock Dove (*C. livia*), the *biset* of the French, a bird of extensive geographical range, being found as far n. as the Faröe islands, and on many parts of the coasts of Europe, Asia as far as Japan, and the n. of Africa, breeding in crevices of rocks, and often within caverns which open on the sea. It swarms in prodigious numbers in some of the rocky islands of the Mediterranean; and even on the British coasts great numbers are found in some localities, particularly in the Orkneys and Hebrides. Its food consists partly of mollusks and other small animals, partly of grain and seeds; and it often makes unwelcome visits to the corn fields of its vicinity. In a wild state this bird exhibits great uniformity both of size and plumage: being not quite 12 in. in length from the tip of the bill to the end of the tail; the prevailing color bluish-gray, in some parts with green and purple reflections, two broad and distinct bars of black across the closed wings; the lower part of the back white; the tail deep gray, with a broad black bar at the end; the bill blackish-brown; the legs and toes reddish-orange.—Until recently naturalists very generally confounded this species with the Stock Dove or Smaller Wood Pigeon (*C. œnas*), a species which inhabits woods, and generally builds in trees, preferring the hollows of old decaying trees, or the tops of such as have been pollarded and have become bushy—whence the name *stock* dove. In some of the open parts of England, however, it makes its nest in rabbits' burrows or other holes in the ground. It is rather larger than the rock pigeon; its prevailing color is bluish gray, in some parts passing into pale gray, but nowhere into white; the wings destitute of bands; the sides of the neck with green reflections; the breast purplish red. It congregates in large flocks in autumn and winter. It is partially migratory in some parts of Europe; a summer visitant of the northern regions. In Britain it is found only in the southern parts of the island. Its geographical range includes great parts of

Europe and Asia, and the n. of Africa. It feeds on beech-mast, acorns, grain, pulse, etc., and sometimes resorts to turnip-fields to eat the tender tops. Its voice is very different both from that of the rock dove and that of the ring dove. Its flesh is of very fine flavor.—The RING DOVE, WOOD PIGEON, or CUSHAT (*C. palumbus*), is the most common British species, and is diffused over great part of Europe, either as a permanent resident or a summer bird of passage, although it is not found at all in some of the most northern regions; and occurs also in the temperate parts of Asia, and the n. of Africa. Its soft loud *coo* is one of the pleasant intimations of approaching spring. It inhabits woods, and builds its nest among the branches of trees. It is the largest of the British species, being about 17 in. in entire length. It feeds on green corn, young clover, turnip-tops, grain, pulse, acorns, etc. Where it abounds, its voracity is often very injurious to the farmer. It is gregarious in winter. It is in considerable estimation as an article of food; but it is very shy and wary, not easily approached by an inexperienced sportsman.—These are all the usual species of pigeon. Our limits quite preclude us from noticing almost any other. The RING-TAIL PIGEON (*C. Caribbea*) may be mentioned as a West Indian species, much valued for the richness and delicacy of its flesh, which is reckoned one of the greatest luxuries of that part of the world. The BALD-PATE or WHITE-HEADED PIGEON (*C. leucocephala*) is another large and fine species, plentiful in the West Indies. It migrates to the *Keys* of Florida in summer.—The DOUBLE-CRESTED PIGEON (*C. dilopha*) is a large species, inhabiting the n. of Australia and warmer regions to the northward, remarkable for its crest, which consists of two parts, one on the back of the head, and another of lax recurved feathers springing from the forehead, and even from the base of the bill.

Only one species of pigeon has been truly domesticated, and having long been so, it has undergone many remarkable changes, and there are numerous varieties or breeds; some of them, exhibiting very strange peculiarities, and known as *fancy pigeons*, being carefully preserved and tended by pigeon-fanciers. Pigeon-fancying is nowhere carried further than in London, where there are many persons who give great part of their time to it, and whose pigeons are their chief delight. The prices of such fancy pigeons as are deemed most perfect of their kind are very high. The ordinary domestic pigeons, kept for profit as a kind of poultry, differ from the wild rock dove chiefly in color in which they are often very unlike it, although a tendency always manifests itself to return to the original colors, and the bars on the wings are apt to reappear in the progeny even of what may be called the most artificial varieties. Of these may be mentioned, as among the most interesting, the rough-footed pigeon, having the feet feathered; the Jacobin, which has a range of feathers inverted over the head, and extending down each side of the neck, as a hood; the fan-tail, or fan-tailed shaker, in which the number of the tail-feathers is greatly increased, and the bird has the power of erecting its tail like that of a turkey-cock, whilst it has also a peculiar vibratory motion; the tumbler, so called from tumbling in the air in its flight, and further characterized by a very short bill; and the pouter or cropper, which has the power of blowing up its crop to an extraordinary degree, so that the head seems fastened on the top of an inflated bladder. The carrier pigeon (q.v.) is regarded as a variety of the common pigeon.

For the profitable keeping of pigeons the dovecot must be divided into cells, a cell for each pair, each cell 16 in. broad, by 12 from front to back, with the door toward one side, so that the nest may not be seen from without, and a slip of wood in front of each cell for the birds to sit and coo on. The dovecot must be placed at such a height as to be out of the way of rats and other depredators; and must be frequently cleaned, otherwise it may probably be deserted by its occupants. It ought to be painted white, that color being very attractive to pigeons, and contributing to retain them when a new dovecot is established, in which there is often found to be not a little difficulty. Pigeons begin to breed at the age of 9 months, and breed every month except in very cold weather. The male and female continue faithful to each other from year to year, a circumstance noted by Pliny and others of the ancients, and evidently, as well as their somewhat demonstratively manifested affection, a reason of the poetic references often made to the dove. See illus., LARKS, ETC., vol. VIII.; also illus., FOWL, ETC., vol. VI.

PIGEON BERRY. See POKE.

PIGEON COVE, a village in Rockport, Essex co., Mass., Cape Ann coast, about 35 m. from Boston. It is a summer resort, and has several hotels. Pop. '90, 1174.

PIGEON ENGLISH. See PIDGIN ENGLISH.

PIGEON HAWK, *Falco columbarius* of Linnæus, a bird of prey of the falcon family inhabiting the warm and temperate parts of America. It is from 12 to 14 in. in length, with a spread of wing, in the female, of from two feet to 26 inches. The male, as is usual with falcons, is smaller. In the adult the back is of a bluish slate color, every feather having a longitudinal black line. The throat, breast, and belly are of a pale pinkish, yellowish white, each feather with a longitudinal line of very dark brown. The quills are black, with ashy white tips; bill blue, legs reddish yellow, with dark lines. It is the most fierce of all hawks in proportion to its size, and lives upon woodpeckers, thrushes, wild pigeons, snipe, and smaller ducks.

PIGEON PEA, *Cajanus*, a genus of plants of the natural order *leguminosæ*, suborder *papilionaceæ*, of which according to some botanists there is only one species (*C. flavus*), a native of the East Indies, but much cultivated also in the West Indies and in Africa; according to others there are two species, *C. flavus*, with flowers entirely yellow, the pod marbled with dark streaks, and two or three seeds in each pod; and *C. bicolor*, called CONGO PEA in the West Indies, the pulse of which is much coarser, and is used chiefly by negroes. The finer kind is nearly equal to the common pea. This kind of pulse is very much used in tropical countries. The plant is a shrub (*cytisus cajan* of Linnæus) about 18 in. high. It is half-hardy in the s. of England. In tropical countries the plants stand and are productive for several years. They throw off their leaves annually, and reproduce them along with their flowers. The pigeon pea is one of the most valuable of the tropical kinds of pulse. It grows either on rich or poor soils. It is called *doll* and *urhur* in the East Indies. The name pigeon pea is West Indian.

PIGG RIVER, a magisterial dist., Pittsylvania co., Va. Pop. '90, 4578.

PIGMENTS. See PAINTS.

PIGNEROL. See PINEROLO.

PIG-NUT. See HICKORY.

PIGWEED, a name given to some species of *chenopodium*, particularly *C. albrem*, belonging to the goosefoot family (*chenopopiaceæ*), and going by the common name of goosefoot in England. The principal characteristics of the genus are: flowers perfect, all bractless; calyx 5-cleft, with lobes somewhat keeled, more or less enveloping the depressed fruit, stamens generally 5; styles 2, seldom 3. Flowers sessile in small clusters in spiked panicles. The species in this country are all annuals except two. They are quite common, growing in cultivated ground (gardens, plowed orchards, farmyards). The best-known species is *C. album*, sometimes called lamb's quarters, but more often pigweed. It grows from 1 to 3 and 4 ft. high; leaves varying from rhombic-ovate to lanceolate; the lower ones, sometimes all, are angulate toothed, mealy beneath, pale green above. There are several varieties.

PIKA. See LAGOMYS.

PIKE—PIKEMAN. Previously to the use of the bayonet, infantry of the line of battle—that is, the heavy-armed troops—were from the earliest times armed with pikes or spears. The Macedonians carried pikes 24 ft. long; those of modern warfare averaged 12 or 14 feet. They were of stout wood, and tipped with a flat iron spearhead, which sometimes had cutting edges. As a defense against cavalry, the pike, from its length and rigidity, was of great value; but though it long survived the introduction of gunpowder, that event was really fatal to it. For success with the pike, especially in offensive war, a depth of several men was essential, and this depth rendered the fire of artillery peculiarly fatal. The pike is now superseded by the bayonet on the end of the musket.

PIKE, *Esox*, a genus of malacopterous fishes, including all the species of the family *esocidæ*, as restricted by Müller, and characterized by an elongated body, covered with scales, a depressed head, and broad blunt muzzle, with very large mouth, abundantly furnished with teeth of various sizes on the jaws, palatine bones, and vomer; no adipose fin; and the dorsal fin placed very far back over the anal fin. The species are not numerous; they are all inhabitants of fresh waters in the northern hemisphere. Only one is found in Europe, the COMMON PIKE (*E. lucius*), a native also of Asia and North America. It is very generally diffused over Europe, and is abundant even in its most northern regions; and is now abundant in lakes, ponds, and slow rivers in all parts of the British islands, although it is supposed not to be truly indigenous to them, but introduced. The statement, which has been often made, however, that it was introduced in the reign of Henry VIII., is certainly erroneous, as there is evidence of its existence in England at a much earlier date. Edward I., graciously regulating the price of commodities for his subjects, fixed the price of the pike higher than that of the salmon, and ten times higher than that of the turbot and the cod, from which we may perhaps infer its comparative rarity at that period. Some of the waters in the fenny districts of England are peculiarly adapted to pike, which are there found in very great quantity, and of superior quality.

The pike is of a dusky olive-brown color on the upper parts, becoming lighter and mottled with green and yellow on the sides, and passing into silvery white on the belly; the fins brown; the larger fins mottled with white, yellow, and dark green. The tail-fin is forked. The pike grows to a large size, occasionally attaining a weight of 60 or 70 pounds, although the stories of pikes much larger than this are liable to suspicion. The excessive voracity of the pike has long been proverbial. No animal substance which it can swallow, and which is capable of being digested, seems to be unpalatable to it; and no animal large enough to attract its attention, and which it can master, escapes being devoured. Mr. Jesse mentions an instance of eight pike, of about five pounds' weight each, consuming nearly 800 gudgeons in three weeks; and one of them devoured four roach, each about four in. in length, in rapid succession, and seized the fifth, but kept it in his mouth for about a quarter of an hour before swallowing it. The pike readily attacks a fish of own its size, and preys freely on the smaller of its own species. Frogs are frequent prey; water-rats and ducklings are sometimes devoured. A large pike often takes possession of a particular hole in the bank of a river, from which it issues to seize

any creature that may pass.—The pike spawns in the beginning of spring, for that purpose ascending narrow creeks and ditches, in which it is very easily caught by nets. Large quantities are caught at the spawning season in Lapland, and dried for future use. The pike grows very rapidly when the supply of food is abundant, reaching a length of 8 to 10 inches in its first year, 12 to 14 in the second, 18 to 20 in the third, and afterwards increasing for a number of years at the rate of about four pounds every year. A young pike is sometimes called a *jack* or *pickerel*. The name *luce* (Lat. *lucius*) is still known as an English name of the pike. The Scotch name is *gedd*, a name similar to those in the Scandinavian languages.

The flesh of the pike is much esteemed, but that of pikes of moderate size is reckoned superior to that of small, or of very large ones.

The pike is not only caught by means of nets, but by the rod, by set lines, and by *trimmers* or *liggers*, which may be briefly described as floats with lines attached to them, the line being so fastened that the bait swims at a proper depth, and that some yards of line run out when the bait is taken. The floats are sometimes made of wood or cork, sometimes of bundles of rushes, sometimes of bottles. In angling for pike various baits are used, such as a minnow, par, or other small fish, a portion of a fish, etc., and sometimes an artificial fly is employed with great success, made of two large hooks tied together, and adorned with two *moons* from a peacock's tail. The angler unaccustomed to the pike must be cautioned as to the manner of the taking the hook from its mouth, as any rashness may lead to severe laceration of his hand by its teeth. Pike may be fished any time from May to February inclusive, except when it is actually freezing. The best month is considered to be November; the pike are then in the best condition. One of the most approved tackles for angling for the pike is the *spinner*, baited with a small dace, bleak, gudgeon, or par of about two ounces. The mode of using it is thus described in Bailey's *Angler's Instructor* (Longman & Co., 1857): "Having cast your bait as far as possible, allow it, if you are fishing in a pond, or lake, or deep water, to sink a little, say 2 ft., then wind away at a brisk rate, holding your rod on one side rather low; if no run, wind out and throw again, but this time wind brisk four or five yards, then all of a sudden stop a moment, then off again, doing so three or four times in one cast. I have often found this a good plan. If you still have no run try another throw and wind brisk as before, but occasionally giving your rod a sharp but short twitch."

Other species of pike are found in the lakes and rivers of North America, as *esox estor*, which is sprinkled with round blackish spots, and *E. reticularis*, which is marked with a network of brownish lines.

The gar-fish (q.v.) is sometimes called the sea pike. The same name is also given to certain large voracious fishes of warm seas, belonging to the perch family.

The Saury pike is noticed in a separate article.

PIKE, a co. in s.e. Alabama, drained by the head-waters of the Conecuh river and by the Pea river and Patsaliga; 710 sq.m.; pop. '90, 24,423, chiefly of American birth, inclu. colored. Its surface is undulating and largely covered with thick pine forests. Its soil, fertile along the water courses, is sterile in most sections. On the river banks a sandy loam produces sweet potatoes, wheat, cotton, and is adapted to stock-raising and the products of the dairy. It is intersected by the Central of Georgia and the Plant System railroads. Co. seat, Troy.

PIKE, a co. in s.w. Arkansas, drained by the Little Missouri river forming its s.e. boundary, and Antoine creek, its e. border; 620 sq. m.; pop. '90, 8537, chiefly of American birth, with colored. Its surface is hilly and well supplied with building timber. Among its mineral products are limestone, much used for building purposes, gypsum, marl, etc. Its rivers furnish convenient water-power, which is utilized in cotton factories, saw and grist mills. Co. seat, Murfreesboro.

PIKE, a co. in w. Georgia, having Flint river for its w. boundary; 262 sq. m.; pop. '90, 16,300, chiefly of American birth, with colored. It is drained by the Potato river, the Elkins, and other small streams. Its surface is hilly, and largely covered with forests. It is intersected by the Central of Georgia and the Southern railroads. Iron ore abounds, and the soil is moderately fertile, suitable for stock-raising, dairy products, corn, cotton, and sweet potatoes. Co. seat, Zebulon.

PIKE, a co. in w. Illinois, having the Mississippi river for its w. border, separating it from Missouri, and the Illinois river on the e. border; 795 sq. m.; pop. '90, 31,000, chiefly of American birth, with colored. Its surface is nearly level, containing extensive beds of coal, and well-timbered portions diversified by broad, fertile prairie land. Its products are grain, vegetables, and sorghum. Niagara limestone is quarried. It is intersected by the Wabash, and by branches of the Chicago, Burlington and Quincy railroad. Its industries are important and varied, embracing the manufacture of carriages and wagons, cooperage, flour, woolen goods, and iron. Co. seat, Pittsfield.

PIKE, a co. in s.w. Indiana, bounded on the n. by White river, and its e. fork; drained also by Patoka creek; about 310 sq. m.; pop. '90, 18,544, chiefly of American birth. The surface is level and heavily wooded. The soil is fertile. The principal

productions are corn, tobacco, and wheat. Bituminous coal is mined. Co. seat, Petersburg.

PIKE, a co. in e. Kentucky, adjoining Virginia; drained by the Louisa, Elkhorn, and Russell's forks of the Big Sandy river; about 780 sq. m.; pop. '90, 17,378, with colored. The surface is hilly, and heavily wooded. The Cumberland mountains are on the s.e. border. It contains deposits of bituminous coal. Co. seat, Pikeville.

PIKE, a co. in s. Mississippi, having the state line of Louisiana for its s. boundary, drained by the Bogue Chitto and the Tangipahoa rivers; 720 sq. m.; pop. '90, 21,203, chiefly of American birth, includ. colored. Its surface is mostly level, partly covered with hard wood forests, and diversified by groves of cypress and magnolia. Its soil is a sandy loam adapted to the production of cotton. Co. seat, Magnolia.

PIKE, a co. in e. Missouri adjoining Illinois; bounded on the n. e. by the Mississippi river, drained also by Copper and Salt rivers, and Spencer's creek; traversed by the Chicago and Alton and the St. Louis and Hannibal railroads; about 620 sq. m.; pop. '90, 26,321, includ. colored. Co. seat, Bowling Green.

PIKE, a co. in s. Ohio, drained by Scioto river, and Beaver and Sunfish creeks, intersected by the railroad and the Ohio canal; about 436 sq. m.; pop. '90, 17,482, includ. colored. The surface is hilly and heavily timbered. The soil is fertile. The principal productions are corn, wheat, oats, and live stock. Co. seat, Waverly.

PIKE, a co. in n.e. Pennsylvania, adjoining New Jersey and New York, bounded on n.e. and s.e. by the Delaware river; drained also by Shohola and Lackawaxen creeks, and traversed by the Erie railroad; about 620 sq. m.; pop. '90, 9412, chiefly of American birth. The surface is uneven, and the soil mostly poor. Co. seat, Milford.

PIKE, Albert, b. Boston, 1809; entered Harvard collge, but was obliged to leave for want of funds. In 1831 he set out on a western tour and went with an expedition to Santa Fé. In 1832 he explored the head waters of the Brazos and Red rivers, and with four companions went 500 miles on foot, to fort Smith, in Arkansas. After editing the *Arkansas Advocate*, he was admitted to the bar and in 1836 edited the Arkansas revised statutes. He served in the Mexican war, and in the civil war raised a force of Cherokees, and fought on the confederate side. Besides reporting for five years the decisions of the Arkansas supreme court, and publishing *The Arkansas Form-Books*, he wrote *Prose Sketches and Poems* (1834); *Hymns to the Gods* (1839); *Nugæ* (1854); and *Morals and Dogma of Freemasonry* (1870). He was a Freemason of very high rank, and chief of the royal order of Scotland in the United States. He d. in 1891.

PIKE, Austin Franklin, b. Hebron, N. H., 1819; was admitted to the bar, 1848; was in the N. H. Legislature, 1850–52; in the state senate, 1857–58, and during the last year was pres. of the senate; was chairman of the republican state committee, 1858–60; speaker of the N. H. house, 1865–66. He was elected as a republican to congress, 1872, and to the U. S. senate, 1883. He d. in 1886.

PIKE, Mary Hayden (Green), b. Maine, 1825; has published *Ida May* (1854); *Bond and Free* (1858); *The Cypresses* (1865); and other stories.

PIKE, Zebulon Montgomery, 1779–1813, b. N. J.; entered the army in 1799, and was made capt. in 1806. After the cession of Louisiana to this country, he was sent on an exploring expedition to the source of the Mississippi. Leaving St. Louis in 1805, with 20 men and provisions for 4 months, he returned at the end of 9 months, after great sufferings from hunger and cold. In 1806–7 he was sent on a geographical expedition to Louisiana. After a march of 3 months, his party came, as they supposed, to the Red river; but it proved to be the Rio Grande, and they were arrested by a detachment of Spanish cavalry for trespassing on Spanish territory, and carried to Santa Fe. His papers were seized, and he was subjected to a long examination by the commandant gen. of the province of Biscay, who finally sent him home with an escort. He arrived at Natchitoches in 1807, and was thanked by the government. He rose by rapid promotions to the rank of brig.gen. in 1813, when he was also appointed adjt. and inspector gen., and put in command of the land portion of the expedition against York, upper Canada. He arrived at York, April 27, with 1700 men, landed under a heavy fire, and in storming a battery was killed by the explosion of a magazine.

PIKE'S PEAK, a peak of the Rocky mountains, in El Paso county, Colorado, lat. 38° 50′ n., long. 105° 1′ w., discovered by Gen. Pike, U. S. army, in 1806. Its height is 14,147 ft. above the level of the sea, and it commands a magnificent view of over 100 miles' radius of a rugged, mountainous country, containing many lakes, and the sources of four great rivers—the Platte, Arkansas, Rio Grande, and Colorado of California. In 1858 large deposits of gold were discovered here. It abounds in rich gold-bearing quartz. The mining country is 5,000 feet above the sea, with a dry climate, having a rainy season of only seven weeks. A railroad to the top was opened June 30th, 1891. See *Tourist's Guide to the Rocky Mountains*, by Frank Fossett.

PIKE-PERCH, *Lucioperca*, a genus of fishes of the perch family, having two dorsal fins, of which the first has strong spiny rays, but resembling the pike in its elongated form, large mouth, and formidable teeth. The muzzle is not, however, broad and depressed, as in the pike. Several species are known, of which one (*L. sandra*) is common in the Danube, and in most of the rivers and lakes of the n. e. of Europe.

extending westward to the Oder and the Elbe, although not found in Italy, France, or Britain. It is highly esteemed for the table, and its introduction into British rivers seems particularly desirable. Salted and smoked, it is a considerable article of trade in some parts of Europe. It is a fish of rapid growth, and attains a weight of 25 or 30 pounds. This fish readily takes the minnow and the artificial fly. It is called *sander*, *sandel*, or *sandat*, in some parts of Germany; *nagmaul* in Bavaria; and *schill* at Vienna. Another species (*L. Americana*), much resembling it, of a greenish-yellow color, is found in the lakes and rivers of North America.

PILAS'TER, in classical architecture, a square pillar, sometimes standing free, but usually attached to a wall from which it projects $\frac{1}{5}$, $\frac{1}{4}$, or other definite proportion of its breadth. Greek pilasters, or antæ, were of the same breadth from top to bottom, and had different capitals and bases from those of the orders with which they were associated. The Romans gave them a taper like the columns, and the same capitals and bases.

PILATE, PONTIUS, the sixth Roman procurator of Judea. His family name *Pontius* was conspicuous among the Romans at a very early period of their history; and his cognomen *Pilatus*, "armed with a javelin," may refer to military employment and success. He is known in history chiefly as connected officially with the crucifixion. Josephus agrees with the gospels in fixing the date of his administration; and Tacitus unites with the Scriptures, creeds, and all Christian history in affirming that Christ, the founder of the sect of Christians, was put to death by Pontius Pilate in the reign of Tiberius. Of his early history nothing is known. On being appointed to the government of Judea he removed the headquarters of the army from Cæsarea to Jerusalem. He greatly enraged the people by introducing the standards bearing the image of the emperor secretly into the city, and to prevent an insurrection was obliged quickly to withdraw them. On two other occasions he almost drove them to rebellion by similar disregard of their religious convictions. His unwillingness to condemn Jesus, his repeated efforts to release him, and ultimate submission to the clamors of the priests and populace agree well with the representations of secular history concerning the unmanliness of his character, and the fears which he habitually cherished of popular accusation preferred against him to the emperor. The accuracy of the gospel narrative concerning his proceedings at the trial is illustrated by several well-known facts of Roman history. As he was only a procurator he had no quæstor to conduct the trial, and was therefore brought directly into communication with Jesus. At an earlier period Roman governors had not been allowed to have their wives with them in the provinces; but in his time the prohibition had fallen into neglect, and the senate refused to enforce it. The judgment seat spoken of in the gospels was a well-known part of a governor's official equipage; and the "tesselated pavement" was so necessary to the administration of justice that Julius Cæsar carried one with him during his expeditions. The power of putting to death had been taken from the Jews on their subjection to Roman rule. And it is well known that the Romans often scourged prisoners before putting them to death. The New Testament says nothing concerning Pilate after the resurrection of Jesus. But Josephus relates that the Samaritans having accused him of undue severity towards them, Vitellius, then president of Syria, sent him to Rome to answer before the emperor. On his arrival there he found Caligula on the throne. Eusebius says that Pilate, wearied with misfortunes, at length committed suicide. The time and place of his death are not known. One tradition points to a pyramid 50 ft. high, at Vienna on the Rhone, which is called Pontius Pilate's tomb; and another asserts that, having sought in vain to hide his sorrows by the lake of Lucerne, on the mountain now called Mont de Pilate, he at last plunged into its dismal flood. Concerning his official report of the death of Jesus, see ACTS, SPURIOUS OR APOCRYPHAL.

PILATE, ACTS OF. See ACTS, SPURIOUS OR APOCRYPHAL.

PI'LAU, or PILAW, a dish common in India, Turkey, Egypt, and Syria, consists generally of rice, but occasionally some animal food is added. It is sometimes seen at tables in this country, prepared for those who have been accustomed to it abroad. The correct method of preparing it is to boil the rice twenty minutes, with sufficient water to soak it thoroughly, and swell the grains to their utmost, taking care not to break them by making them too soft; it is then drained and gently stirred with butter, pepper, and finely-chopped onions, and served up. This is the way in which the pilaus of the poorer classes are prepared; but for the tables of the more wealthy, fowls, lamb, mutton, shreds of ham or bacon, variously cooked, but always much boiled or roasted, are placed on the top of the rice and served up with it. In India very numerous and elaborate recipes are in use.

PIL'CHARD, *Clupea pilchardus*, or *Alausa pilchardus*, an important fish of the family *clupeïdæ*, referred by some naturalists to the same genus with the herring (*clupea*), and by others to the same genus with the shad (*alausa*). The pilchard is nearly equal in size to the herring, but rather thicker, and the lines of the back and belly are straighter; the scales are also larger and fewer; and the dorsal fin is rather further forward. The mouth is small, and in the adult fish destitute of teeth; the under jaw longer than the upper. The upper part of the body is bluish-green; the sides and belly silvery-white;

the cheeks and gill-covers tinged with golden yellow, and marked with radiating striæ the dorsal fin and tail dusky. The pilchard is an inhabitant of more southern seas than the herring, being nowhere plentiful on the British coasts, having of late deserted the coasts of Cornwall and Devon, where it was once found; whilst it occurs on many parts of the Atlantic coasts of France and Spain, and on the coasts of Portugal, and is found in the Mediterranean sea. Like the herring, it was formerly supposed to be a migratory fish, annually visiting the coasts of England and other countries; but, as in the case of the herring, this opinion has now been relinquished; and the shoals of pilchards which are seen on the coasts are believed merely to issue from deeper waters near at hand, for the purpose of spawning. The spawning season of the pilchard begins early in summer; but on the coasts of Devonshire and Cornwall, the principal fishery is in August and September. Pilchards are caught either with drift-nets or seine-nets, but principally with seine-nets. By means of one or more seine, each 360 ft. long and 36 ft. deep, a shoal is inclosed; the bottom of the net is then drawn together by a peculiar contrivance, and the pilchards are taken out at low water by small bag-nets. Prodigious numbers are sometimes inclosed in a single seine. Twenty-four millions and a half are said to have been taken at once from a single shoal, which, however, may have been spread over several sq. miles. The approach of a shoal of pilchards is known by the rippling of the water, and the sea-birds hovering above, and is often watched for and marked from the shore. In some years the quantity taken in the pilchard fishery on the English coast is enormous, and the capital invested in it in Devonshire and Cornwall is probably not much under $5,000,000. The English pilchard fishery is regulated by several acts of parliament, the first of which are of the days of Elizabeth. Great quantities of pilchards are annually exported to the West Indies and elsewhere. Those intended for exportation are pickled, and packed in barrels by means of great pressure, by which oil is expressed to the amount of three or four gallons from a hogshead of fish. The oil, with the blood and pickle with which it is mingled, is generally used for manure. A favorite Devonshire dish is a pie made of pilchards, with their heads protruding from the crust. It is now generally admitted that the pilchard and the sardine are identical, and a Cornish sardine company has been started for preparing pilchards, like sardines, in oil. It is said that the Cornish sardines cannot be distinguished from those imported from France.—A great number of boats are employed in the pilchard fishery in and near the estuary of the Tagus.

PILCOMAY'O, a river of South America, whose course has not as yet been thoroughly explored, draws its waters from the Bolivian Andes, and is formed by the confluence of two rivers, the Suipacha and the Pilaya. Of these head-waters, the south one, the Suipacha, rises in the mountains immediately s. of Potosi; while the northern branch, the Pilaya, drains the valleys around Chuquisaca. These streams unite in lat. about 21° 35′ s., to form the Pilcomayo, which flows in a general direction s.e., crosses the Bolivian frontier, waters the n.e. region of the Argentine Confederation, and falls into the Paraguay a few miles below Asuncion. It is about 1400 m. in length; but its waters are much spent in lagunes on its course, so that it adds no great volume to the waters of the Paraguay. It is navigable for about 500 m.; but numerous hordes of hostile Indians render navigation perilous. Before entering the Paraguay, it divides into two arms, of which the northern is called Araguay-Guaso; and the southern, which is again divided into two branches, the Araguay-Mino. The mouths of the Pilcomayo are narrow, deep and much obstructed by water-plants.

PILE, in heraldry (from Lat. *pilum*, a javelin; or from the *pile* or stake used in the construction of a bridge), an ordinary, or, according to some heralds, a subordinary, in the form of a wedge, issuing generally from the middle chief, and extending towards the middle base of the shield. It is said that a pile should occupy one-third of the breadth of the chief, or, if charged, double that breadth. When a pile is borne issuing, not from the middle chief, but from some other part of the bounding-line of the shield, this must be specified in the blazon. Three piles are sometimes borne conjoined in point. A pile *transposed* is one whose point is upward.

PILE-BRIDGE, a bridge of which the piers are built with piles. These may be either temporary wooden structures, in which wooden piles, driven into the ground, serve also as piers, or they may be permanent bridges, with iron cylinders forming the piles below the surface, and piers above. See PILES.

PILES are usually squared logs of wood used in engineering operations, such as dams, bridges, roads, etc. They are sharpened at the point, and, if necessary, protected with iron points, to enable them to cut through the strata they encounter as they are driven into the ground. When used for coffer-dams, or such temporary purposes, they are placed close together, and driven firmly into the earth; the water is then pumped out, and the piles form a dam, to enable workmen to lay foundations of piers, etc. When the force of the water round the dam is great, two rows of piles are driven in all round, and the space between the rows filled with clay, and puddled. Piles are also used for permanent works, when they are driven through loose soil till they reach a firm bottom, and thus form a foundation on which buildings, roads, etc., may be placed.

Cast-iron is frequently used for piles, which are cast hollow. Wharf-walls are some-

times built of piles; they are then cast with grooves on the sides, into which cast-iron plates (forming the walls) are fitted.

A kind of pile has been invented by Mr. Mitchell, which is of great use in very loose and shifting substances. It is called the screw-pile, and consists of a long shaft (of wrought iron), with a broad cast-iron disk, of a screw form at the lower end. These piles are especially useful for light-houses, beacons, etc., which have to be placed on sands. They are fixed by means of capstans, which give them a rotatory motion. Common piles are driven in by machines called *pile-drivers*. In these a heavy weight (or monkey) is raised to a considerable height between two guides, and then let fall on the head of the pile. The application of steam to these drivers has made them very powerful engines—Nasmyth's steam-hammer being a well-known instance.

In 1843 Dr. L. H. Potts obtained a patent for a new kind of pile, which consists of hollow tubes of iron, from which the sand, etc., within them is removed by means of an air-pump, and the pipes are then sunk.

In recent railway bridges, cylinders have been much used to form both piles and piers. They are of cast-iron, and made in pieces (of about 6 ft. in height), which are applied one on the top of another. The sand or gravel is removed from the inside of the first laid, which thus sinks down; another cylinder is placed above it, and the same process continued till it also has sunk sufficiently; and so on, cylinder over cylinder, till a solid foundation is reached. The requisite number of cylinders is then piled up to form the pier above ground.

PILES, or HEMORRHOIDS are small tumors situated either within or on the verge of the anus. They consist of folds of mucous and sub-mucous membrane in an inflamed, infiltrated, or permanently thickened condition, and usually contain enlarged veins. There are several varieties of these tumors. Sometimes the pile is mainly composed of a little knot of varicose veins in the sub-mucous tissue; in this case it is readily emptied, by pressure, of the fluid blood contained in it, which, however, returns when the pressure is removed. Sometimes the blood in a dilated vein coagulates, forming a solid tumor surrounded by tissues, thickened in consequence of inflammation; or the tumor may consist of a kind of erectile tissue formed by an abnormal condition of the vessels of the mucous membrane; this variety is especially liable to bleed. These tumors are divided into *bleeding* and *blind* piles, according as they are or are not accompanied with hemorrhage; and into *internal* and *external* piles, according as they are within or without the sphincter muscle of the anus.

The following are the general symptoms of this affection. The patient, after having experienced for a varying time a feeling of heat, fullness, and dull pain about the lower part of the bowel, becomes conscious of a sensation as if there were a foreign body in the anus; and, on examination after an evacuation, discovers a small tumor, usually about the size of a grape, which either remains outside, or is retracted, according as it originated without or within the sphincter. This tumor gradually increases, and others form around it, until a mass at length results as large as a pigeon's egg, or larger. In its ordinary *indolent* state the tumor has little sensibility, and occasions comparatively little annoyance; but when it is *inflamed* (from strangulation of the sphincter muscle, or from any other cause), it is exquisitely tender to the touch, and is the seat of burning and stinging sensations, rendering the evacuation of the bowels (and sometimes of the bladder also) difficult and painful. In women an inflamed pile may cause pain in the back, irritation of the womb, with mucous discharge, and many other anomalous symptoms. In severe cases the patient can neither stand nor sit with comfort, and only finds relief in the horizontal position.

Piles may be caused by any circumstances which cause congestion in the lower bowel, such as luxurious and sedentary habits of life, pregnancy, and such diseases of the liver as tend to check the return of blood from the veins of the rectum. Moreover, anything that causes irritation of the rectum, such as acrid purgatives and especially aloes, dysentery, inflammation of the prostate gland, etc., may cause piles. But of all causes, constipation is probably the most frequent; it operates in producing them partly by the pressure of the accumulated and hardened fæces upon the veins carrying the blood away from the rectum, and partly by the straining and irritation such fæces occasion during their evacuation.

In the treatment of piles, it is expedient to relieve the congested state of the lower bowel by one or two doses of sulphate of magnesia, and a cooling vegetable diet, after which the continued use of mild laxatives should be resorted to. A teaspoonful of an electuary, consisting of an ounce of confection of senna, half an ounce of cream of tartar, and half an ounce of sulphur, if taken in the middle of the day, usually acts gently about bedtime, which is far the best time for the bowels of patients of this kind to act, as the parts irritated by the passage of the evacuation become quieted during the night. In long-standing cases, in which there is general relaxation of the mucous membrane, the confection of pepper in doses of a dram may be given thrice daily with advantage, or a scruple of common pitch may be taken at bedtime in the form of pills or in capsules. Amongst the milder forms of local treatment must be mentioned (1) the injection of the rectum with cold water both before and after the motion; (2) washing the anus with yellow soap and water after each evacuation; (3) the application of gall

ointment or of other astringents; and (4) the injection of astringent lotions, as, for instance, of sulphate of iron, in the proportion of a grain to an ounce of water. If these fail, recourse may be had to pressure by means of instruments specially devised for the purpose; to the application of strong nitric acid, which, in the case of internal piles, affords the most speedy and effective means of relief (the operation must, of course, be performed by a surgeon, and if the parts cannot be protruded, the acid must be applied through the speculum); to ligature; or, in the case of external piles, to excision. When the piles are inflamed, leeches to the anus (but not applied directly to the tumors) are sometimes required; but the inflammation generally subsides under the influence of rest in the horizontal position, fomentations, poultices, and low diet.

The treatment of the hemorrhage that frequently accompanies piles requires a few words. If the bleeding is moderate in quantity, and has continued for some time without inducing weakness or any other bad symptom, it is not expedient to interfere with it. When, however, it obviously requires checking, the effect of cold water injected into the rectum, as already recommended, should be tried, and, in case of its failing, astringent injections should be had recourse to. At the same time, the patient should remain in the horizontal position, and take the medicines usually prescribed for internal hemorrhage, amongst which may be especially mentioned oil of turpentine, in doses of 20 drops three or four times a day, or ergot of rye in divided doses to the extent of a dram daily. In rare cases it is necessary to tie a vessel, or to touch it with a red-hot wire (through the speculum), or to plug the anus.

PI'LEUS. See FUNGI.

PILEWORT. See RANUNCULUS.

PIL'GRIM (Ital. *pellegrino*, Lat. *peregrinus*, "a visitor of foreign lands"). A pilgrim is one who visits, with religious intent, some place reputed to possess especial holiness. The early Christians, like the Jews and the pagan Gentiles, regarded certain places with special religious interest; above all, the Holy Land, and particularly the scenes of the passion of our Lord at Jerusalem. St. Jerome (Ep. xliv.) refers the practice of visiting Jerusalem to the discovery of the holy cross by St. Helena. He himself was a zealous pilgrim; and throughout the 4th, 5th, and 6th c., pilgrims habitually undertook the long and perilous journey to the Holy Land from almost every part of the west. Other sacred places, too, were held to be fit objects of the same visits of religious veneration. The tombs of the apostles Peter and Paul, and of the martyrs in the catacombs at Rome, are so described by St. Jerome (*Commentar. in Ezekiel*). St. Basil speaks in the same terms of the tomb of the forty martyrs; and the historian Theodoret tells of not only visiting such sanctuaries, but of hanging up therein, as offerings, gold and silver ornaments, and even models of hands, feet, eyes, etc., in commemoration of the cures of diseases supernaturally obtained as the fruit of these pious visits. The PILGRIMAGE, however, pre-eminently so called, was that of the Holy Land; and even after Jerusalem had been occupied by the Saracens, the liberty of pilgrimage, on payment of a tax, was formally secured by treaty; and it was from the necessity of protecting pilgrims from outrage that the well-known military orders (q.v.) had their origin. The crusades (q.v.) may be regarded as a pilgrimage on a great scale; the direct object being to secure for the Latin Christians immunity of pilgrimage. On the other hand, the final abandonment of the crusades led to a great extension of what may be called domestic pilgrimage, and drew into religious notice and veneration many shrines in Europe, which, after the lapse of time, became celebrated places of pious resort. The chief places of pilgrimage in the west were: in Italy—Rome, Loretto (q.v.), Genetsano, Assisi; in Spain—Compostella, Guadalupe, Montserrat; in France—Fourvieres, Puy, St. Denis; in Germany—Oetting, Zell, Cologne, Trier, Einsiedeln; in England—Walsingham, Canterbury, and many others of minor note. The pilgrim commonly bound himself only by a temporary vow (differing in this from the palmer, q.v.) terminating with the actual visit to the place of pilgrimage, or at least with the return home, and by which he was bound for the time to chastity and to certain other ascetic observances. The costume consisted of a black or gray gabardine girt with a cincture, from which a shell and scrip were suspended, a broad hat, ornamented with scallop-shells, and a long staff. Many abuses arose out of these pilgrimages, the popular notions regarding which may be gathered—although, probably, with a dash of caricature—from Chaucer's *Canterbury Tales*. Pilgrimages, which have always subsisted in Italy, Spain, southern Germany, and Switzerland, had gone much into disuse in France during and since the revolution. In late years, however, pilgrims have resorted in large numbers, not only to the ancient sanctuaries of Notre Dame de la Garde, de Fourvieres, de Puy, etc., but also to La Salette, Lourdes, Paray-le-Monial, and Pontigny. In 1873 and 1874 organized parties of pilgrims on a very large scale from France, Belgium, England, the United States, etc., visited the sanctuary of Paray-le-Monial, the place at which the vision of Marie Alacoque, which gave rise to the devotion to the sacred heart of Jesus (q.v.) is recorded to have taken place.

PILGRIM FATHERS is a name given to those emigrants who came to America early in the seventeenth century on account of religious differences in England, and founded the colony of Plymouth. Those who came in the first three ships are also called "old comers" and "forefathers." The first ship, the *Mayflower*, arrived in December, 1620, and had on board one hundred souls; the second, the *Fortune*, came in November, 1621, and brought twenty-nine; while the *Anne*, and the *Little James* came in August, 1623,

and brought forty-six souls. See also, MASSACHUSETTS, PLYMOUTH, MASS.; ROBINSON, JOHN.

PILLAR, a detached support like a column; but its section may be of any shape, whereas the column is always round. Pillars have been used in all styles of architecture, and their forms and ornaments are usually amongst the most characteristic features of the style. The Greek and Roman pillars (or columns) are the distinguishing elements in the various orders. In Gothic architecture, also, the pillars are of different forms at the various epochs of that style. First, in the Norman period, we have plain massive pillars, square, circular, and octagonal, frequently ornamented with zigzag ornaments, spiral bands, etc., on the surface. As vaulting progressed, the system of breaking the plain surface, and giving to each portion of the vaulting a separate little column or shaft to support it was introduced. This was done either by attaching shafts to the circular pillars, or by cutting nooks in the pillar and setting little shafts in them.

In the early pointed style a plain circular or octagonal pillar, with a number of small shafts attached around it, is a favorite arrangement.

In this style, the attached shafts are very frequently banded to the main pillar at different heights, and they are sometimes made of a finer material, such as Purbec marble. In the decorated style the pillar is of a lozenge form, and not so much ornamented with detached shafts as with moldings; plain, circular, or octagonal pillars, however, are used in this, as in all the styles. The moldings and shafts are usually filleted; and some of the moldings run up into the arch without any cap. In perpendicular the same idea is further carried out; the moldings become thinner, and are more frequently run up into the arch without caps. See FLAMBOYANT.

PILLAR SAINTS—called also "STYLITES" (Gr. from *stylos*, a column), "pillarists," "holy birds," "air martyrs," and several similar names—a very remarkable class of anchoretical ascetics (see ASCETICISM), chiefly of Syria, who, with a view to separating themselves more completely from earth and fellow-men, took up their abode on the tops of pillars, on which they remained without ever descending to earth, and exposed to all the variations of a Syrian climate. The earliest of them, and the most celebrated, Simeon (called also Simon) the Stylite, had been a monk, and had lived, in the beginning of the 5th c., in extreme seclusion in his monastery for nine years, without ever moving from his narrow cell. Increasing in enthusiasm, he withdrew to a place about 40 m. from Antioch, where he built a pillar, on the top of which, only a yard in diameter, he took up his position. From this pillar he removed to several others in succession, each higher than its predecessor, till at last he attained to 40 cubits, or about 60 ft. in height. In this mode of life he spent 37 years, his neck loaded with an iron chain, and his lips engaged in constant prayers, during the recitation of which he bent his body so that his forehead touched his feet. His powers of fasting were no less marvelous; he is said to have frequently limited himself to a single meal in the week, and during the 40 days of Lent abstained entirely from food. The fame of his sanctity brought crowds of pilgrims from the most distant countries, even Britain itself, to see him; and the admiration of his austerities is said to have converted many pagans and Saracens to the church. In trial of his virtue, through the test of humility, some neighboring monks reproaching him with vanity and the love of novelty in this extraordinary mode of life, ordered him to come down from his pillar. Simeon prepared without hesitation to comply, and the compliance was accepted as an evidence of his perfect humility and holiness of purpose. It is said that in consequence of an ulcer which was formed on one of his legs, he was obliged for the last year of his life to remain on his pillar upon one foot. In this position he died in 460, aged 72 years. A disciple of Simeon, named Daniel, succeeded to his reputation for sanctity, and to his mode of life, which he maintained for 33 years, in the still more trying climate of the shores of the Bosporus, about 4 m. from Constantinople. The marvels of Daniel's career are still more startling. He was sometimes almost blown by the storms of Thrace from the top of his pillar. At times for days together he was covered with snow and ice. How he sustained life, what nourishment he took, was a mystery even to his disciples. The emperor at length insisted on a covering being placed over the top of the pillar, and Daniel survived till the year 494. In Syria there were many pillar saints as far down as the 12th c.; but in the west, Daniel is all but a solitary example. A monk named Wulfailich, near Trier, attempted the pillar life in the 6th c., but the neighboring bishops compelled him to desist, and destroyed his pillar.

PILLARS OF HERCULES. See HERCULES, PILLARS OF.

PILLAU, a sea-port t. of Prussia, at the entrance of Frische Haff, on the Baltic, 25 m. w. of Konigsberg; pop. abt. 3500. It is also the port for Ebling and Braunsberg, and is beautifully situated on a strip of land called Paradise. It has a fortress and a school of navigation, and is a leading watering-place. It was founded in 1722.

PILLNITZ, a palace and ordinary summer residence of the royal family of Saxony, in a beautiful situation 6 m. s e. of Dresden. The grounds are finely diversified, and the walks ascend to the summits of hills, of which one is nearly 1000 ft. high. Pillnitz acquires a historic interest from the meeting of princes held in the castle in Aug., 1791, when the declaration of Pillnitz was framed, according to which Austria and Prussia agreed to declare the circumstances of the king of France (then a prisoner in the Tuil-

eries, after his ineffective flight to Varennes) to be a matter of common interest to the sovereigns of Europe, and to express the hope that common cause would be made for his restoration. The emperor and the king of Prussia were resolved to use force in order to effect this result; but any immediate interference on their part was rendered unnecessary by Louis's acceptation of the constitution as modified by the national assembly, after which he was again placed on the throne.

PILLORY, an engine for the public punishment of criminals, disused in Britain since 1837; but previous to that time commonly employed, as it also was in France and Germany. It consisted of a stout plank fixed like a sign-board on the top of a pole, the pole being supported on a wooden platform elevated above the ground. Above, and parallel to this plank another of similar dimensions was placed in a similar position with respect to the pole, and fixed to the former by a hinge, being thus capable of being moved upwards from it, or closed upon it, when necessary. A large circular hole is cut, with its center in the line of junction of the two planks, and two corresponding holes of smaller size are formed, one on each side of it; the large hole is for receiving the neck, and the two smaller the wrists. When a criminal is to be placed in the pillory, he is made to mount and stand upon the platform; the upper of the two hinged planks is raised to allow the culprit's neck and wrists to be inserted in their proper grooves, and then brought down into its place, and fastened by a padlock, or in some other way. The pillory seems to have existed in England before the Conquest, in the form of the stretch-neck (an instrument by which the neck only was confined), and was originally intended, according to the "statute of the pillory" (51 Hen. III. c. 6), for "forestallers, users of deceitful weights, perjury, forgery, etc.," and all such dishonorable offenses. Its use was exclusively confined to this class of offenders till 1637, when restrictions were put upon the press, and all who printed books without a license were put in the pillory. From this time it became the favorite mode of punishing libelers (or those who were considered to be such by the government), authors and publishers of seditious pamphlets, or of strictures on the government; and many eminent men were accordingly from this time put "in and on the pillory," among whom may be mentioned Leighton, Lilburn and Warton the printers, Prynne, Dr. Bastwick, Daniel Defoe, etc. The insufficiency of the pillory as a means of inflicting a definite amount of punishment was now apparent, for to those who were popular favorites it was no punishment at all, while those who were objects of popular dislike were ill-used to such an extent as occasionally to cause death. The sufferers above mentioned being popular favorites, or having at least a numerous class of supporters, were shaded from the sun, fed, and otherwise carefully attended to; while the encouragement, applause, and sympathy of the crowd around converted the intended punishment into a triumph; but such men as Titus Oates, and the class of offenders including perjurers, swindlers, polygamists, etc., who were objects of popular hatred and disgust, were pelted with rotten eggs (the favorite missile), garbage, mud, sometimes even with more dangerous missiles. In 1814 the celebrated naval hero lord Cochrane (see DUNDONALD, EARL OF) was sentenced to the pillory, but the government of the day was not prepared to brave the consequences of such an act, and the sentence was not carried into effect. In France the pillory was anciently called *pilori*, and in recent times *carcan*, from the iron collar by which the criminal's neck was attached to the post; but punishment by this mode was abolished in that country in 1832.

PILLOW, GIDEON JOHNSON, 1806–78; b. Tenn.; son of Gideon, and grandson of John, a revolutionary soldier; graduated at the university of Nashville, 1827; commenced the practice of law in Columbia, Tenn., 1830; soon ranking among the eminent lawyers of his state. President Polk, in acknowledgment of certain services rendered in his nomination and election, commissioned him brigadier-general, 1846. He went to the Mexican war in command of a brigade of Tennessee volunteers, and was with Scott at Vera Cruz. He was conspicuous in the operations which caused the capitulation of that city, and was one of the commissioners to negotiate terms. He was wounded at Cerro Gordo while leading an assault; promoted to maj.gen., 1847. He was in the battles of Contreras and Churubusco, and was wounded at Chapultepec. After the war he returned to private life, settling on a large estate. In 1850 he was a member of the Nashville southern convention where he opposed the ultra views of some delegates. He was active in raising men for the confederate army, and was a maj.gen. on that side during the civil war.

PILLS are the most generally convenient and popular of all forms of medicine. They are formed from masses of a consistence sufficient to preserve the globular shape, and yet not so hard as to be of too difficult solution in the stomach and intestines. This form is especially suitable for (1) all remedies which operate in small doses, as metallic salts; (2) those which are designed to act slowly and gradually, as certain alteratives; (3) those which are too readily soluble when exhibited in other forms; (4) substances whose operation it is desirable to retard until they have reached the lower intestines, as in certain pills for habitual costiveness; (5) bodies whose specific gravities are too inconsiderable to allow their suspension in aqueous vehicles; and (6) fetid substances: while it is unsuitable for (1) medicines which require to be given in large doses; (2) deliquescent salts: (3) fluid or semi-fluid substances, such as oils, balsams, etc., which require a very

large proportion of some dry powder to render them sufficiently tenacious to form into a mass; (4) substances so insoluble, that when exhibited in solid form they pass through the intestinal canal unaltered, as extract of logwood (Paris's *Pharmacologia*, 9th ed. p. 550). Many substances, such as vegetable extracts, may be at once formed into pills without any addition; but most substances require the addition of a material termed an excipient, for converting it into a pill-mass. The excipients in most common use are bread-crumbs, hard soap, extract of liquorice, mucilage, syrup, treacle, honey, castor oil, and conserve of roses. From the property of preserving pills for a long time in a properly soft state, the most valuable excipient is the conserve of red roses; and, perhaps, next to it treacle is the most valuable excipient, as it does not undergo any change by time, but maintains a proper consistence, and preserves the properties of vegetable powders unimpaired for years. It is common to place pills in some fine powder, to prevent them from adhering to each other, and to conceal their taste. For this purpose, liquorice powder, wheat flour, starch, and magnesia are generally used in this country, and lycopodium on the continent. Pills retain their moisture and activity far longer in small bottles than in the ordinary pasteboard boxes. The ordinary weight of a pill is 5 grains; if it much exceeds that weight, it is too bulky to swallow conveniently if it consist of vegetable matter. It is very common to meet with patients who express their inability to take this form of medicine. If, however, they practice with a small globular mass, toward which they feel no repugnance, as a pellet of bread or a currant; placing it on the back of the tongue, and gulping it down with water, they will soon get over the difficulty. See CAPSULES.

PILLSBURY, JOHN S.; b. N. H., abt. 1827: removed to Minn., 1854, and settled at the Falls of St. Anthony. He was member of the Minn. legislature for more than 10 years, and a regent of the state university for many more. He was governor of Minnesota in 1876–82, and gave the state university $150,000 in 1889.

PILOT is a person specially deputed to take charge of a ship while passing through a particular sea, reach, or dangerous channel. The intricacy of almost all coast navigation renders it impossible that any navigator, however skillful, can be master of all the waters to which he may have to sail his ship; and the risk of failure, through ignorance of local dangers, is therefore avoided by transferring the direction of her course to some one perfectly acquainted with the spot. The man to whom so much is intrusted must be a responsible person, and therefore in all countries qualified sailors are officially licensed to act as pilots in their districts, and they are granted the monopoly. The origin of the word pilot is uncertain; but it is probably taken from or nearly identical with the Dutch *pijlloot*, which is compounded of *peilen*, to sound the depth, and the root which appears in D. *lootsman*, O. E. *lodesman*, and signifies to lead, direct. Pilot thus means one who conducts a vessel by sounding. The laws of Wisby, promulgated at least as early as the 14th c., and subsequently incorporated in nearly every maritime code, render it compulsory on the master of a ship to employ a pilot when sailing near a coast.

The British laws relating to pilots were revised and consolidated by the act 16 and 17 Vict. c. 129. Certain fees are established in proportion to the distance and responsibility; and the master of every vessel, above 50 tons, passing up the channel or the Thames, or *vice versâ*, is required to accept the services of the first pilot tendering, provided he shows his license as a proof of qualification. Except in matters of discipline, the command of the vessel is then vested entirely in the pilot, who can have the sails, steering, etc., of the ship carried on entirely at his discretion until the limit of the pilot's district is passed, except that the captain resumes his powers when the question of taking up ground in a harbor is concerned. The fees vary with the draught of the ship and the distance; as specimens, may be cited the highest and lowest in the London district: a ship drawing 22 ft. of water is piloted from Orfordness to Blackwall for £27 12s; a ship drawing not more than 7 ft. is guided from Gravesend Reach to Long Reach for 9s. 3d

Pilots are associated in guilds called brotherhoods, of which the principal are the brotherhood of the Trinity House of Deptford-Stroud, situated on Tower Hill, which has jurisdiction over the Thames, Medway, and the coast from Harwich to the Isle of Wight; and the Trinity houses of Kingston-upon-Hull and Newcastle-on-Tyne. There are also societies of pilots at the larger ports out of these districts, the government in such case being vested in certain officials lawfully appointed as "pilotage authorities."

Pilots board vessels entering their districts in boats conspicuously painted, on the bows and sails of which must be the man's distinguishing number as shown by his license. The boat also bears a flag of comparatively large size, of red and white divided horizontally. A ship requiring a pilot hoists a square blue flag. In passing up or down the Thames, every ship above 50 tons or 6 ft. draught must bear a pilot; but her master or first-mate may act by license in that capacity, if he have passed the necessary examination. A master is subject to a penalty for sailing without a pilot; and, on the other hand, so also is any person, without a license, or whose license has been forfeited, presuming to act or offering to act as a pilot.

In the navies of some countries the pilot is a permanent officer of the ship, and has charge of her course; but his functions in that case approach nearer to those of the British navigating officer.

The general rule as to the responsibility of the owners of the ship is, that no owner or master of a ship is answerable to any person whatever for any loss or damage, occasioned by the fault or incapacity of any qualified pilot, acting in charge of such ship within any district where the employment of the pilot is compulsory.

In the United States all regular pilots are controlled as to their examinations, qualifications and conduct, by the laws of the states within whose waters they are licensed to ply their trade. Under the provision of the constitution giving congress power to "regulate commerce with foreign nations and between the several states," the national legislature in 1789, 1837, and 1866, passed acts granting to the states power to enact each its own regulations regarding pilotage. In all they are licensed to offer themselves, and while the ship's master is usually obliged to accept the first pilot boarding him, the pilot on his part is generally compelled to obey the call of the ship-master. The pilot's fee is called pilotage, and for it there is a lien on the ship which may be enforced in an admiralty court. The master need not give up control of the ship when first boarded unless he choose; at New York the pilots often find a vessel two or three hundred miles at sea, but the practice is for the pilot to take control 15 or 20 m. off Sandy Hook. The duty of the pilot does not extend beyond the proper guidance of the ship. The captain is responsible for the proper execution of the necessary orders. It has been held by the U. S. supreme court that the mere fact that a licensed pilot is on board a vessel will not relieve the owners from liability in case of collision. If a ship refuse to take a license, a good defense exists in an action against insurers of goods or vessel. In New York about 180 pilots are licensed by the board of commissioners. The license is revocable for misconduct or inefficiency; and, in case of loss through the pilot's fault, the pilotage is forfeited, and perhaps a suit for damages would lie. The pilotage for taking a ship into N. Y. harbor varies from $2.70 to $6.50 per foot of the vessel's draft, with $4 added in winter, and one-quarter added to the rate if the ship be boarded outside Sandy Hook. Outward pilotage is somewhat less. Vessels going in and out of the Sound through Hell Gate are obliged to take a pilot or pay a fixed sum in commutation. This is generally regarded as a hardship, most coast sailors being fully competent to make the passage safely.

PILOT CHART is issued monthly from the United States Hydrographic Office, navy department, and is different in character from all other charts with which the navigator has to deal. It is what is known as a track chart, with the addition of a great deal of timely, interesting, and useful data, which do not appear on any other chart. The object is, first, to supply a reliable chart upon which to plot a vessel's track after getting clear of the coast (where, of course, more detailed and larger scale charts are used); and, secondly, to present graphically any information relating to the North Atlantic of interest and value to mariners during each month of the year.

At present the North Atlantic is the only ocean covered by the pilot chart. The base of the chart is on Mercator's Projection between 0° and 60° in latitude, and 10° e. and 102° w. in longitude, and this portion of the work, does not change from month to month. It includes the coast lines, islands, etc., and is lithographed in black. There is a compass card near the top for use in laying off the courses steered, and storm diagrams in the lower left-hand corner illustrate the circulation of the wind around an area of low barometer. One of these diagrams answers for ordinary storms along the transatlantic route; a second shows storms between latitudes 20° and 33°, and a third between latitudes 10° to 30°. In the first the storm track is considered as moving n.n.e. to e.n.e.; in the second n.n.w. to n.n.e.; and in the third w. by n. to n.n.w. An explanation of the symbols used is given, and a note stating that information collected during the month preceding the date of issue appears on the chart in red ink, and the matter giving a general meteorological forecast for the current month appears in blue. The lines of variation and the 100-fathom curve as the coast is approached are plainly marked in dotted lines. These variation lines or curves are of great importance to mariners who have to depend upon the compass, and they vary with the position of the ship. Thus from Cape Race to New York the variation of the compass changes from 30° w. to less than 10° w., and from Cape Race to New Orleans from 30° w. to more than 5° e. In addition to the meteorological data there are plotted, in blue, the principal steamship and sailing routes recommended for the month, the percentages of calms, and the frequency and force of the prevailing winds. The last two are for each five-degree square into which the ocean is for convenience divided, for owing to there being no meteorological stations on the high seas, it is necessary to group together observations made on board vessels in some way by which they can be localized and averaged up, and five-degree squares were found the most convenient. The probable limit of frequent fog is indicated by double dotted lines. Broken lines show the probable n.e. and s.e. trades, the lower limit for the latter being south of the Equator does not appear. Where the northeast and southeast trades meet there is a region of equatorial rains, which is indicated by a broad dotted belt of irregular shape, lying principally northward of the Equator. The storm signals showing the combinations to indicate the winds are given, together with an explanation of their meaning, and the method of using them. The weather forecast, for the months with the barometer normals and directions for correcting a vessel's barometer, complete the data in blue. In red color appears the review of the weather for the past month, with details of extraordinary storms and of any remarkable

experiences of particular vessels during the bad weather. On the ocean there are plotted the latest reported positions of derelict vessels, wrecks, and drifting buoys, and wherever possible the course taken by these derelicts is distinctly marked. There are also plotted the positions where whales and water-spouts were reported during the previous month.

A red belt off Nantucket, and also at the entrance of the English channel, shows the fog limit. Ice bergs and field ice are shown, and warnings in relation to probable ice, and what has already been encountered, are given. The tracks of violent storms are plotted, the dates being given to show where the storm was central at noon on the day given. The width of this line varies with the intensity of the storm, so that the whole history of its course is graphically depicted. A large amount of printed matter is found, showing dangerous obstructions to navigation reported the previous month, charts published, canceled, or extensively corrected by the Hydrographic Office, changes in lights, buoyage, etc.

Any particularly important matter, such as hurricanes, severe storms of any kind, remarks on the use of oil, barometer diagrams, the height of surf along the coast, temperature curves, results of throwing bottles overboard to ascertain drift and set of currents, notices to mariners, transatlantic steamship and sailing routes, the reported positions of the logs that broke away from a large lumber raft that was abandoned off Nantucket, and various other similar subjects, likely to be of timely interest, are specially treated as they arise and are given all the space that the limits of the chart will admit.

To one who is not familiar with the subject, it would seem almost impossible to publish on one chart such a variety of information, of such a diverse character, and yet have a chart that can be of practical use in plotting a vessel's track. It would be very difficult to do so, and have it contain everything, if black and white were alone used, and consequently, to simplify and avoid all confusion the red and blue colors were introduced. Ordinary charts, it will probably be understood, are simply printed in black and white, but the data given have by no means the range that is shown by the Pilot Chart.

PILOT-FISH, *Naucrates ductors*, a fish of the family *scomberidæ*, and belonging to a section of that family in which the first dorsal fin is represented by mere spines, and there are no finlets behind the second dorsal and the anal fins as in the mackerel, etc. The shape of the pilot-fish is very similar to that of the mackerel. It is usually about a foot long; the general color silvery grayish-blue, five dark-blue transverse bands passing round the whole body. Its flesh is very delicate, and resembles mackerel in flavor. It is common in the Mediterranean, and appears to be widely diffused through the warmer parts of the ocean, often following ships for a long time and very far, in which way it has been known to come from Alexandria to Plymouth. It is, however, of rare occurrence, even on the southern coasts of Britain. It is supposed to be the *pompilius* of the ancients, which was believed to point out their desired course to sailors. It is often seen in the company of a shark, and is therefore very commonly supposed to direct the shark to its prey. Concerning this many wonderful stories are to be found in the writings both of voyagers and of naturalists. It has been contended, on the other hand, that the pilot-fish merely follows the ship along with the shark for the same object that gulls follow the steamboats on our coasts, to feed on anything eatable that may fall or be thrown overboard; or that it attends the shark in order to seize small morsels of its large prey. The following statements of Dr. Bennett may be received with confidence: "I have observed that if several sharks swim together, the pilot-fishes are generally absent; whereas, on a solitary shark being seen, it is equally rare to find it unacompanied by one or more of these reputed guides. . . . The only method by which I could procure this fish was, that when capturing a shark I was aware these faithful little fishes would not forsake him until he was taken on board; therefore by keeping the shark, when hooked, in the water until he was exhausted, or, as the sailors term it, 'drowned,' the pilot-fish kept close to the surface of the water over the shark, and by the aid of a dipping-net fixed to the end of a long stick, I was enabled to secure it with great facility" (*Gatherings of a Naturalist*).—A much larger species of *naucrates* is found on the coasts of South America.

PILOT KNOB, in Iron co., Missouri, 73 m. s.w. of St. Louis, is a conical, circular hill, about a mile in diameter at its base, and 600 ft. high. It consists of beds of iron ore, porphyry, and porphyry conglomerates. The bed of iron ore lies under a conglomerate 140 ft. thick, in which layers of ore are frequent. The extent of the ore bed is about 200,000 square yards. The ore is hard specular, steel-gray in color, extremely brittle, and has little lustre.

PILOT MOUNTAIN. See Ararat.

PILOTY, Karl Theodor von, b. Munich, Bavaria, 1826. He studied art there and at other great art centers of Europe, and devoted himself to historical painting. His first work, 1853, was the "Establishment of the Catholic League." He afterward produced many pictures of great merit, among which are "Wallenstein's Assassination" (1858); "Nero Among the Ruins of Rome"(1861), and "The Death of Cæsar." In 1874 he was elected president of the Munich academy of fine arts, of which he had for many years been a professor. He d. 1886.

PILPAI. See Bidpai.

PILSBURY, Amos; b. Londonderry, N. H., 1805: received a common school education; at 18 years of age had served a four years' apprenticeship to the tanner's trade; in 1824 became a guard in the N. H. state prison, of which his father, Moses P., was warden; in 1827 became deputy warden, and in 1830 succeeded his father as warden of the Conn. state prison at Wethersfield. In 1845 he was invited to Albany, where, with a brief interval, he had charge of the Albany co. penitentiary, which he built and afterwards enlarged at a total cost of less than $100,000, till his death in 1873.

PILSEN, a city of Bohemia, in a fertile and beautiful valley at the confluence of the Mies and the Beraun, 52 m. w.s.w. of Prague. The church of St. Bartholomew (built in 1292), the town-hall, and the house of the Teutonic Knights are interesting Gothic edifices. The town also contains a gymnasium and other educational institutions, an arsenal, theater, and a number of churches and convents. Pilsen has leather and cloth factories, a great alum-work, iron and coal mines, and an important brewery. Pop. '90, comm. 50,221.

PIM, Bedford Capperton Trevylian, b. England, 1826; educated for the royal navy. He took part in the search for sir John Franklin, and was the first to pass from the e. to the w. side of the n.w. passage. He was in the Russian war, was dangerously wounded in China, and was made a commander in 1858. He was retired from the service in 1870 with the rank of capt., called to the English bar in 1873, and returned to parliament in 1874. Among his writings are *The Gate of the Pacific* (1863); *The War Chronicle* (1873); and *An Essay on Feudal Tenures*. He d. in 1886.

PIMA, a co. in s. Arizona, adjoining Mexico, bounded on the n. by the Rio Gila, drained by the Rio Santa Cruz and Rio San Pedro; about 10,596 sq.m.; pop. '90, 12,673, chiefly of American birth. The surface consists of table-lands intersected by mountain-chains. Co. seat, Tucson,

PIMAS, or Névomes, an Indian tribe in Arizona, Sonora, and Sinaloa; embracing the Pimas, Eredeves, Joves, and Opatas. The Pimas proper live in earth-roofed huts, in villages. They cultivate cotton, and make baskets and rough pottery. The Pimas in Arizona live on a reservation of 64,000 acres granted them in 1859. They number about 4,000, and support themselves by agriculture. Jesuit missions were established among the Pimas in the 17th c., and there is now a mission of the Reformed church among them. The Opatas live in Sonora, and are the most civilized of the Pima tribes.

PIMENTO, Pimenta, Allspice, or Jamaica Pepper, a well-known spice, is the dried fruit of *eugenia pimento* (see Eugenia), a small West Indian tree, which grows to the height of 20 or 30 ft., and has oblong or oval leaves about 4 in. long, of a deep shining green, and numerous axillary and terminal trichotomous panicles of white flowers, followed by small dark-purple berries. The pimento tree is much cultivated in some of the West Indian islands. It is a very beautiful tree, with straight trunk and much branching head, and about the month of July is covered with an exuberance of flowers, which diffuse a rich aromatic odor. The leaves and bark partake of the aromatic property for which the fruit is valued. The fruit, when ripe, is filled with a sweet pulp, and the aromatic property, which so strongly characterizes it in an unripe state, has in a great measure disappeared. The gathering of the berries, therefore, takes place as soon as they have reached their full size, which is about that of pepper-corns. They are gathered by the hand, and dried in the sun on raised wooden floors, during which process great care is taken, by turning and winnowing, to prevent them from being injured by moisture. Their color changes in drying from green to reddish-brown. When dry they are packed in bags for the market. Some planters kiln-dry them.—The name *allspice* was given to pimento from a supposed resemblance in flavor to a mixture of cinnamon, nutmeg, and cloves. Pimento is much employed in cookery, and is also used in medicine as a carminative and stimulant to prevent the griping of purgatives and to disguise the taste of nauseous drugs. It depends for its properties chiefly on a volatile oil, *oil of pimento*, which is obtained from it by distillation with water, and is sometimes used to relieve toothache, and for making the *spirit of pimento* (or of *allspice*) and *pimento* (or *allspice*) *water* of the shops.

PIMPERNEL, *Anagallis*, a genus of plants of the natural order *primulaceæ*, having a wheel-shaped corolla, and the capsule opening by division round the middle. The species are elegant little annual and perennial plants, natives chiefly of temperate climates. The flowers are not large, but very beautiful.—The Scarlet Pimpernel (*A. arvensis*) is a common plant in Britain, occurring as a weed in fields and gardens; it is common also in most parts of Europe and in many parts of Asia. The flowers are of a fine scarlet color, with a purple circle at the eye. There is a common belief in England, mentioned by lord Bacon, that when this plant opens its flowers in the morning a fine day may be expected; and they certainly close very readily on the approach of rain. They usually open about eight in the morning and close about noon.—The Blue Pimpernel (*A. cærulea*) is far less common in Britain but very abundant in some parts of Europe.—The Bog Pimpernel (*A. tenella*), frequent in bogs in England, but rare in Scotland, is an exquisitely beautiful plant.—Several species are cultivated in our flower-gardens.—Acrid properties prevail in this genus, and *A. arvensis* has been used medicinally in epilepsy, dropsy, and mania.—The name Water Pimpernel is given to *samolus valerandi*, also called *brookweed*, another British plant of the same order, with racemes of small white flowers, growing in watery gravelly places. It is supposed to be the *samolus* which Pliny says the Druids gathered fasting, with the left hand, and without looking

at it, ascribing to it magical virtues in the cure and prevention of diseases in cattle. Its geographic distribution extends over almost all the world.

PIN. As a requisite of the toilet, etc., pins were first used in Britain in the latter part of the 15th c.; they were at first made of iron wire, but in 1540 brass ones were imported from France by Catharine Howard, queen of Henry VIII. Several inventions, however, were previously in use for holding together parts of the dress, such as buckles, brooches, laces, clasps, hooks, etc. At first pins were made by filing a point to a proper length of wire, and then twisting a piece of fine wire around the other extremity, or fixing it after twisting, in order to form a knob or head; and ultimately these operations were so skillfully conducted that a completely round head was made of very small size, and scarcely showing the nature of its construction. Some pins are still made in this way. It is surprising how many operations are needed to complete so small an article. They are as follows: 1. *Straightening and Cutting the Wire.*—The straightening is necessary, because the wire-drawers coil the wire as they make it upon a cylinder, and when it is unrolled the coils remain. It is therefore drawn through an arrangement of upright iron rods which completely straighten it, after which it is cut into lengths of 30 ft., and these are again reduced to lengths of four pins. 2. *Pointing.*—This is done by two operations and different workmen, each standing at a separate grindstone; the first is the rough grinder, and the second the finisher. Each holds with the thumb on the palm of the hand a number of the wires amounting to 30 or 40, and by a movement of his thumb he manages to make the wires turn round so as to make a point to each as he holds them to the grindstones, the second of which, being of a fine material, gives them a smooth finish; they are then reversed and the other end pointed. 3. *Cutting.*—The length of a single pin is cut off of each end of these pieces; the intermediate portions are then handed back to the pointers, and each end receives a point, after which they are divided into two, and thus the four pin piece is reduced into single pin lengths, each having a point. 4. *Twisting the Heads.*—These are made of very thin wire, which is coiled twice by means of a lathe around the end of another piece of wire the same thickness as the pins. 5. *Cutting the Heads.*—The head being formed on the thin wire it is handed to another workman who cuts it off; these two operations are performed with great rapidity, so great, indeed, that as many as 12,000 have been made in an hour. 6. *Annealing the Heads.*—This is softening them by putting some thousands into an iron ladle, and after making them red hot, plunging them into cold water. 7. *Stamping or Shaping the Heads.*—This is pressing the heads into a better shape by means of a small lever press, and at the same time fixing them on the pins; a good worker will do as many as 12,000 to 15,000 per day. 8. *Yellowing or Cleaning the Pins.*—This is done by a process which is often called *souring;* it consists in boiling them for about half an hour in the dregs of sour beer or a solution of argol or cream of tartar, and then washing them in clean water. 9. *Whitening or Tinning.*—In this process a large copper pan is used, and in it is first placed a layer of about six pounds of the cleaned or yellowed pins, and over these a layer of grain-tin to the amount of about eight pounds. Several alternate layers of pins and tin are put in one vessel, and then by a pipe arranged inside the copper pan water is gently poured in, and goes through the pipe to the bottom, first rising up through the different layers so gently as not to disturb them. Fire is now applied to the bottom of the pan, and when it is nearly boiling its surface is sprinkled with a quarter of a pound of cream of tartar, and the whole is slowly boiled for half an hour, then poured into a strainer and shaken to separate the pins from the grain-tin and liquid; by this process a thin deposit of tin has been thrown on the pins which are now white instead of yellow; without the souring this would not take place, it being essential that they should be quite free from any oxidation or soil. 10. *Washing.*—The pins are now thoroughly washed in pure water. 11. *Drying and Polishing.*—They are now put into a large leathern bag with a quantity of bran and violently shaken backward and forward by two men. 12. *Winnowing.*—The bran is next separated by fanning. 13. *Pricking the Papers to receive the Pins.*—This is now done by an ingenious machine, through which the papers are passed, and which, at regular intervals, arranged according to the size of the pins, pinches up a fold of the paper, and at the same time pricks the holes to receive the pins, and then places the pins in their places. Formerly this required a separate operation. Thus 14 persons were required to make and put up for sale a pin, and in some manufactories this is still the case; but in all the large establishments machines are now employed, and an immense reduction of hand labor is effected by them.

The first machine was invented by Lemuel Wellman Wright, of the United States, in 1824. This did very little more than make solid heads to the pins, by a process in principle like that used for nail-making—viz., by driving a portion of the pin itself into a counter-sunk hole. The action, however, was automatic, and consisted in an arrangement by which the wire was seized in two small grooved cheeks. When both cheeks are placed face to face, and the wire is held tightly in the groove with a small portion projecting, a small ram or hammer connected with the machine strikes on the projecting portion described, and compresses it into a small cup-shaped depression, and thus the head is formed. The pointing and dressing of the pins was afterwards carried on as described in the processes for hand-made pins. Since Wright's invention many remarkable improvements have been effected in these machines, which have consequently

become very complicated in their details, although the principles upon which they act are very simple. No description would convey a satisfactory idea of these wonderful pieces of mechanism, which now, without the aid of hands, complete the pin in all respects except the coloring and polishing; but a slight account of the leading features will enable the reader to understand their mode of working. First, then, a reel of wire as it comes from the wire-drawer is placed in the rear of the machine, and the end of the wire is taken hold of by a pair of nippers, which pull it over a fixed *straightening-board*, and pass it on completely straightened, until it is seized by two cheeks, when a cutter descends and cuts it off, leaving the projecting part for the head; on the withdrawal of the cutter, the hammer flies forward, and makes the head as before described; the cheeks open, and the pins drop on to a sloping metal plate finely grooved, down which they slip with the heads upwards, until the end which is to be pointed comes in contact with a cylindrical roller with a grinding surface, which soon grinds points upon them, owing to two or three ingenious arrangements: the first is, that the grooved surface of the plate by which the pins descend terminates a little above the grinding roller, then a slight depression is given to the sloping plate and also to the roller, so that one end is an inch or two lower than the other; therefore, as the pin descends the groove, and is thus brought down the inclined plate, until it lies on the smooth part, where it is highest, and with its end in contact with the grinding roller which is revolving, the pin itself is compelled by the friction of the roller to turn round, and gradually descends from the upper to the lower part of the inclined plate, and then falls off into a box placed to receive it. These operations are performed so rapidly that they can scarcely be followed by the eye, and the pins fall into the box beautifully pointed in a complete stream. They are then *yellowed, tinned,* and prepared for papering, which is a remarkable process. The machine by which it is done is worked by two children; one feeds the machine with pins, the other with papers. The first part of the machine is a box, about 12 in. long by 6 in. broad, and 4 in. deep; the bottom is made of small square steel bars, sufficiently wide apart to let the shank of the pin fall through but not the head, and they are just as thick as the space between papered pins. The lower part of the bottom of the box is made to detach itself as soon as the row of pins is complete, and row after row at regular intervals is received and passed down a corresponding set of grooves, until they reach the paper, which, as before described, is pinched into regular folds and pierced to receive the pins, which, by the nicest imaginable adjustments, come exactly to their places, and are pressed into them. In this way many thousands of those neat-looking paper packages of pins, with which all are familiar, are put up in one day, by two little girls, aided by these wonderful machines.

PI'NA CLOTH, a very beautiful fabric made of the fibers of the leaves of the pine-apple plant (*Ananassa sativa*), and other allied species. This cloth is only made in Manila, and in its manufacture resembles horse-hair cloth, because the threads both of warp and weft are each single unspun fibers, consequently only small pieces can be made; the workers have, however, a plan of joining the fibers of the coarser kinds end to end, so as to make warp threads of considerable length. Pina cloth is very strong, and the better sorts far excel the finest lawns in texture. It is chiefly employed in the manufacture of ladies' pocket-handkerchiefs, which often have their costliness much increased by beautiful embroidery.

PINACOTHEK, a picture-gallery in Munich, completed in 1836, after designs by Klenze, the architect of the Glyptothek. It comprises also the new Pinacothek, completed in 1853, and in which are placed the works of contemporary artists. The main gallery is one of the most important in its contents in Europe. One compartment contains only the works of Raphael; while the largest hall in the building is devoted to 95 works by Rubens. There are, altogether, about 1300 paintings, including specimens of Cimabue, Giotto, Leonardo da Vinci, Correggio, Titian, Michael Angelo, Albert Dürer, Rembrandt, and Vandyke. It comprises the best works of the royal collections, these being arranged with regard to their various schools, in 9 halls and 23 compartments. The building is itself a monument of art, one of its corridors being divided into 25 *loggie* frescoed by Cornelius, with works illustrative of the history of the fine arts in the middle ages. The lower story of the building contains 9,000 drawings by the old masters; the original drawings for Cornelius's *loggie;* and a cabinet of more than 300,000 engravings. There is also an important collection of Etruscan and other vases. The new Pinacothek contains Kaulbach's "Destruction of Jerusalem," and Wilkie's celebrated "Reading of the Will." See illus., BAVARIA, vol. II.

PINAL, a co. in s. Arizona, drained by the Gila river, pop. '90, 4251, half of American birth. The surface is mountainous and contains gold and silver. Area, 5300 sq. m. Co. seat, Florence.

PINAS'TER. See PINE.

PINCH'BECK is an alloy of zinc and copper, in which the proportions slightly differ from those which constitute brass; 3 parts zinc to 16 of copper constitute this material, instead of 1 part of the former to 2 of the latter as in common brass. Pinchbeck, when new, has a color resembling red gold, and it was at the beginning of the present century much employed in making watch-cases and other small articles in imitation of gold.

PINCKNEY, CHARLES, b. Charleston, S. C.; the second son of Thomas Pinckney, founder of the family. He was educated in England, returned to South Carolina, and there practiced law for many years. In 1752 he was made king's councilor and chief justice of the province. In 1753 Chief-Justice Pinckney again visited England, where he spent 5 years, returning shortly before his death in 1759.

PINCKNEY, CHARLES, LL.D., 1758–1824; b. Charleston, S. C.; admitted to the bar, and elected to the provincial assembly in 1779. He was captured at the surrender of Charleston, and remained a prisoner till the peace. He was elected to congress from South Carolina in 1785; was a member of the convention which drew up the U. S. constitution in 1787; of the South Carolina convention which ratified it in 1788, and president of the convention which framed the South Carolina constitution in 1790. He was elected governor of the state in 1789, 1791, and 1796; and in 1798 became U. S. senator. He was a leader of the republican party, a warm supporter of Jefferson for the presidency in 1800, and was appointed by him minister to Spain in 1802. While there, he secured from the Spanish government a release of its interest in the territory sold by France to the United States. He was again elected governor in 1806. His last appearance in public life was as a determined opponent of the Missouri compromise.

PINCKNEY, CHARLES COTESWORTH, LL.D., 1746–1825; b. Charleston; son of Chief Justice Charles. He was educated in England, graduated at Oxford, and studied law. After a short residence at the royal military academy, in Caen, France, he began the practice of his profession at Charleston, in 1769, and soon became prominent in politics. He served in the first provincial congress of South Carolina, was elected col. of a provincial regiment in 1775: was at the capture of fort Johnson, and the repulse of the British squadron off fort Moultrie. He was afterward one of Washington's aids-de-camp, was at Brandywine and Germantown; and returning to the south in 1778, joined the expedition to Florida. Soon after his election in 1779 to the presidency of the South Carolina senate, he joined Moultrie in the defense of Charleston against the British under Prevost. He showed great gallantry in the attack upon Savannah in October of the same year; commanded fort Moultrie during the siege of Charleston, upon whose surrender, which he had vigorously resisted, he was taken prisoner, and he was not exchanged till February, 1782. After the evacuation of the city the following December, he resumed practice. He was a prominent member of the U. S. constitutional convention in 1787; of the South Carolina convention which ratified the new U. S. constitution, and of the convention which in 1790 framed a state constitution for South Carolina. Sent to France in 1796 as U. S. minister, he was received with studied discourtesy by the directory, which finally made him leave the country; nor on his return to France, as a joint commissioner with Elbridge Gerry and John Marshall, was his reception more favorable. Talleyrand assured the commissioners that a gift of money to the French government was a necessary preliminary to the negotiations, and that a refusal would bring on war. Pinckney is said to have answered: "War be it, then; millions for defense, sir, but not one cent for tribute!" On his return to this country a war with France seemed imminent; and he was appointed a major-general. His last appearance in public life was as a federalist candidate with John Adams, in the presidential election of 1800.

PINCKNEY, THOMAS, 1750–1828, b. Charleston; brother of Charles Cotesworth, educated at Westminster and Oxford, and called to the English bar. He returned to Charleston in 1770; became a lieutenant in a provincial regiment in 1775, and was soon promoted major. He was appointed aid-de-camp to Gen. Lincoln; distinguished himself at the battle of Stono, and commanded a column of the American army in the attack upon Savannah in 1779. After the surrender of Charleston he joined the army under Gates, and was dangerously wounded and taken prisoner at Camden; remaining in confinement at Philadelphia till the close of the war. In 1789 he was elected governor of South Carolina; in 1792 appointed minister to England, and in 1794 minister to Spain. After negotiating the treaty of St. Ildefonso, which guaranteed to the United States the free navigation of the Mississippi, he returned, and was a federalist congressman for the Charleston district, 1799–1801. As major-general of the southern military division, in 1812, he fought the Seminoles and Creeks, giving a crushing defeat to the latter, at the battle of Horse-Shoe Bend.

PINCKNEYA, or Georgia bark, a shrub growing in low or swampy land in Florida, Georgia, and South Carolina, rarely found elsewhere. It belongs to the botanical family of *rubiaceæ*, has large oval leaves, and beautiful clusters of purple-spotted flowers at the ends of the branches. It has medical qualities akin to Peruvian bark and is used by the country people as a substitute for quinine.

PIN'DAR (Gr. *Pindaros*), the great lyric poet of Greece, was born about 522 B.C. of a noble family of Thebes, at Cynoscephalæ, a village in that territory. His genius for music was hereditary, and at an early age he was sent by his father, himself a flute-player, to receive instruction in the same art from Scopelinus. At this time his genius for poetry too—foreshadowed, according to later writers, by a swarm of bees miraculously resting on his lips when asleep—began to develop itself, and so he went to Athens to be placed under the tuition of Lasus of Hermione, the founder of the Athenian school

of dithyrambic poetry. Before completing his 20th year he returned to Thebes, where he continued to pursue his studies under Myrtis and Corinna, of Tanagra, two poetesses then famous in Bœotia. With both of his instructresses he contested the prize for music at Thebes, but was five times defeated by Corinna. He was still a young man when he entered on his professional career as a poet, and his services soon came to be in great request on festive occasions throughout all the Hellenic states. He composed choral songs for Hiero, tyrant of Syracuse; Alexander, son of Amyntas, king of Macedonia; Theron, tyrant of Agrigentum; Arcesilaus, king of Cyrene; and also for many free states and private individuals. He won not only the admiration of his employers for his lyrical genius, but also their respect for his independent character, which, amid all the presents and rewards conferred upon him, never degenerated into that of the poet who merely performed for hire. He was especially the favorite of Alexander, king of Macedonia, and of Hiero, tyrant of Syracuse; and it is said that to the praises he lavished on the former of these monarchs his house owed its preservation at the hands of Alexander the great, when he reduced the rest of Thebes to ruins. His life was for the most part spent abroad at the courts of kings, and at the scenes of the great public games; and at one period, 473 B.C., he resided at Syracuse at the court of Hiero for the space of four years. He died most probably in 442 B.C., in his 80th year. Of the immense number of his poems, consisting of hymns to the gods, pæans, dithyrambs, odes for processions (*prosodia*), maidens' songs (*partheneia*), mimic dancing songs (*hyporchemata*), convivial songs (*scolia*), dirges (*threnoi*), and encomia on princes, we only possess fragments. His *epinikia*, or triumphal odes, however, have come down to us entire; and it is from these—divided into four books, and celebrating the victories won in the Olympian, Pythian, Nemean, and Isthmian games respectively—that we must form an opinion of Pindar as a poet. A victory at these games conferred honor not upon the winner and his family only, but also on the city to which he belonged; and for its celebration—which began with a procession to the temple, where sacrifice was offered, and ended with a convivial banquet—a poem was specially composed, and was sung by a chorus either during the procession, or, more frequently, at the banquet (*comus*). Pindar's poetical style is peculiar. Full of bold conceptions and striking metaphors, his manner is so rapid and so subject to abrupt transitions, as to render him not only a difficult but an obscure composer. Typical examples of his strength, as well as of his weakness, will be found in the second Olympian and first Pythian odes, where the description of the islands of the blest in the former, and of an eruption of mount Ætna in the latter, are brilliant offsets to the shadowy mythological allusion and the undeveloped metaphor which also characterize them. His meters, in spite of the able efforts of Böckh, still remain to be satisfactorily elucidated; and all that we can here say of them is, that he makes chief use of the Dorian rhythm, and not unfrequently of the Æolian and Lydian. He has been fortunate neither in his numerous imitators nor translators—Gray being, perhaps, the most successful among the former, and Carey, Abraham Moore, Morice, and Baring among the latter. He has been elaborately explained and criticised in Schmidt's *Pindar's Leben und Dichtung* (1852); while his relation to lyric poetry in general forms the subject of Villemain's brilliant *Essais sur le Génie de Pindare et sur la Poesie Lyrique* (1859). The best editions are those of Böckh; of Dissen, re-edited by Schneidewin; of Bergk (*Poetæ Lyrici*), Fennell (1882), and B. L. Gildersleeve (1887). See also the exhaustive work of Fraccaroli, *Le Odi di Pindaro* (1894).

PINDAR, PETER. See WOLCOT.

PIND DADAN' KHAN, a t. in the Punjab, stands on a narrow verdant plain on the right bank of the Jhelum, and at the southern base of the Salt range or Kalabagh mountains, 110 m. n.w. of Lahore. The town consists of three groups of houses, four m. from the Jhelum. The houses are built of mud, but the framework is of cedar-wood. In the vicinity, salt is extensively raised in the Salt Range. Pop. 15,100. See PUNJAB.

PINDEMONTE, IPPOLITO, 1753–1828; b. Italy; educated at Modena and Este; made a European tour, lived for some time in Malta, and finally took up his residence near Verona. Among his works are *Prose e Poesié Campestri* (1795); *Arminio* a tragedy, (1804); *Sermoni* (1805); *Epistole in Versi* (1819); and *Elogi di Letterati* (1825–26). His brother, GIOVANNI, 1751–1812, published a number of dramas, and a translation of Ovid's *Remedia Amoris*.

PIN'DUS, anciently the name of a chain of mountains in Greece (q.v.).

PINE, *Pinus*, a genus of trees of the natural order *coniferæ*. The Linnæan genus includes all kinds of fir, larch, and cedar; but as now limited, the genus *pinus* is distinguished by monœcious flowers, and woody cones with numerous two-seeded scales, the scales having an angular truncated apex. The leaves are linear and very narrow, of a very dark-green color, growing in clusters or in pairs, and surrounded by scarious scales at the base. To this genus belong many noble and useful trees. They mostly grow in mountainous or other exposed situations, and their narrow leaves are admirably adapted to evade the force of winds, which produce in the tops of pines a peculiar sound, much noticed by the ancient poets, more soft and continuous than in trees of richer foliage. Most of the pines are more or less social, one kind often covering a considerable tract; some of them clothing the sides and even the summits of mountains with mag-

nificent but somber forests; some growing in lower situations, on otherwise unproductive sandy grounds, as the *pine barrens* of North America. The pines growing in the most barren soils, or in the coldest climates and most exposed situations, are often very small; and although very unlike any other shrubs or bushes, are scarcely to be called trees. Pines are widely diffused over the northern hemisphere, being found on mountains within and near the tropics, and in the colder temperate and the arctic regions descending to the level of the sea.

The Scotch Pine or Scotch Fir (*P. sylvestris*) is the only species indigenous to Britain. It has leaves in pairs, about an inch and a half long; the cones about the same length, obtuse, and with unarmed scales. On very poor soils and at great elevations it is reduced to a kind of shrub, but in favorable situations it becomes a lofty tree. A plank five feet and a half in diameter has been obtained from a Scottish forest. The Scotch pine is of quick growth, but has been known to attain the age of 400 years. Its head is somewhat conical or rounded, and the lower branches die off as the tree grows, leaving the older trees bare of branches for the greater part of their height; but it is more apt to send off large branches than most of the coniferæ. There are still native forests of Scotch pine at Braemar and elsewhere in the highlands of Scotland; and even in the south of Scotland noble trees are to be seen which, probably, were not planted by man. The Scotch pine is not indigenous to the south of England; but, having been introduced, is spreading rapidly and spontaneously, along with the pinaster, in some of the heaths and other unfertile tracts. Immense forests of it exist in some countries of Europe, in some of which it is mingled with the spruce fir. In the middle and north of Europe and of Asia it is found even in plains near the level of the sea, especially where the soil is somewhat sandy; in the south of Europe it grows only on mountains. Its timber is highly valuable, being very resinous and durable, and is the *red deal* or *red pine* used in house and ship-carpentry. There is very great difference, however, in the timber of Scotch pine growing in different soils and situations, rich soils and sheltered situations being unfavorable to the quality of the timber, which becomes white, soft, and comparatively worthless; and there exist several varieties of Scotch pine, some of which yield very superior timber. One of the best varieties is that which forms the northern Scottish forests, often designated *Braemar pine* by nurserymen. It is remarkable for its very horizontal branches, and is therefore sometimes called *P. horizontalis*.—The Scotch pine is not only valuable for its timber, which is available for some purpose at every stage of its growth, but on account of other products. Common turpentine is in great part obtained from it, and much tar, pitch, resin, and lamp-black. See these heads. Oil of turpentine is sometimes distilled from the cones, and even from the leaves; the leaves have also been used in Germany for the manufacture of a substance resembling tow, and called *waldwolle* (forest wool), suitable for stuffing cushions, etc. The resinous roots are dug out of the ground in many parts of the highlands of Scotland, and being divided into small splinters, are used to give light in cottages instead of candles. Fishermen, in some places, make ropes of the inner bark, which is applied to a very different use, when most soft and succulent in spring, by the Kamtchatdales and Laplanders, being dried, ground, steeped in water to remove the resinous taste, and used for making a coarse kind of bread. See illustration, Coniferæ, vol. IV., fig. 1.—The Dwarf Pine (*P. pumilio* or *P. Mughus*) is found on the Alps and Pyrenees, its trunk often lying on the ground, although sometimes it appears as a bush or low tree. The recumbent trunks are called *krummholz* (crooked-wood) and *knieholz* (knee-wood) by the Germans.—The leaves are in pairs, very like those of the Scotch pine, but a little longer; the cones are also similar. From the young shoots an oil resembling oil of turpentine is obtained by distillation, which is a kind of universal medicine among the peasantry of Hungary, as is also the resin spontaneously exuding from the tree, which is known as *Hungarian balsam*.—The Black Pine, or Black Fir (*P. nigricans*, or *P. Austriaca*), is another species closely allied to the Scotch pine, but remarkable for its very long leaves. It is a native of Austria. It abounds in resin more than any other European tree.—To the same group of pines belongs the Seaside or Taurian Pine (*P. Pallasiana, maritima*, or *Taurica*), which also affords resin in great quantity, and of a very pleasant odor. It is found in many parts of the south of Europe. Its timber is of little value; but great part of the turpentine of the *Landes* and other maritime districts of France is obtained from it. It yields also part of the *Burgundy pitch* of the apothecaries' shops.—The Aleppo Pine (*P. Halepensis*), a native of the south of Europe, Syria, etc., is a very graceful tree of moderate size, with leaves in pairs and slender. It yields a liquid resin or turpentine, which is extracted from it in Provence and elsewhere, and sold as *Venice turpentine*. The wood is extensively used in the Levant for ship-building.—The Laricio (*P. laricio*) has leaves in pairs, lax, and 4 to 8 in. long, cones 2 to 4 in. long, with the scales slightly pointed. It is often called the Corsican Pine. It grows on the shores of the Mediterranean sea, and is valuable both for its timber and for its resinous products. In the island of Corsica, it frequently attains the height of 140 feet. It grows well in sandy soils, and has been made particularly useful for preventing the drifting of the sand, and turning to account the otherwise useless tracts between the mouths of the Garonne and the Adour in France, thus also preserving valuable lands which the sand threatened to overwhelm. The Pinaster or Cluster Pine (*P. pinaster*) is another of the most important European species. It has

cones in whorls of 3, 4, or even 8 together, 4 to 6 in. long, leaves in pairs, and very long. It is found on the shores of the Mediterranean, and also in the Himalaya and in China. It has been used in France to a great extent, in the same way as the Laricio, for covering waste sandy tracts. The timber is of inferior quality, but great quantities of resin are procured from it. It yields *Bordeaux turpentine*.—The Pyrenean Pine (*P. Pyrenaica*) is a majestic tree, a native of the Pyrenees, and producing very fine timber.—The Calabrian Pine (*P. Bruttia*) somewhat resembles the pinaster.—The Stone Pine (*P. pinea*) a tree with a broad umbrella-shaped head, a form often seen also in the Scotch fir, forms a characteristic feature of the scenery of the Mediterranean, and is very often introduced in paintings. It is the *pinie* of the Germans, the *pignon* of the French. The leaves are in pairs, 4 to 5 in. long; the cones very large, ovate, and obtuse. The seeds, which do not ripen till the fourth year, are large, abound in a fixed oil, and when fresh have a sweet taste resembling that of almonds. They are used in Italy and other countries in the same way as almonds and pistachio nuts for the dessert, in various dishes, also in emulsions, etc., under the names of *pinies*, *pinioles*, and *pignons*. The use of them, however, is almost entirely confined to the countries in which they are produced, as they very soon become rancid. They are sometimes imported into London in the cone, in which way they can be kept longer, but the cost of importation is much increased. The wood of this tree is very useful and beautiful. It yields resinous products only in small quantity.—The Cembra Pine, or Swiss Stone Pine, which grows in the central parts of Europe and the south of Siberia—a stately tree, with the lower branches more persistent than they are in most pines, and rigid leaves in groups of three to five—also produces eatable seeds (*Cembra nuts*), which, although they are extracted with difficulty, are much used. The cuticle contains a resinous juice; but in Siberia this fruit is so much prized, that noble trees are often cut down to obtain it. The Cembra pine yields a pellucid, whitish oil, resembling oil of turpentine, and known as *Carpathian balsam*.

North America produces many species of pine, some of them very beautiful and very valuable. Besides those long known, and which are found in the states and colonies near the Atlantic, a number of the noblest species of this genus have, since the commencement of the present century, been discovered in California and the n.w. parts of America.—The Red Canadian Pine (*P. resinosa*) is found from Canada to the Pacific, but does not reach far south in the United States. It is the Yellow Pine of Canada and Nova Scotia. It delights in dry and sandy soils, and attains a height of 70 to 80 ft., with a diameter of 2 ft. at the base, the trunk continuing of uniform diameter for two-thirds of its length. The leaves are in pairs, and are congregated towards the extremities of the branches. The timber is highly esteemed for strength and durability, and furnishes excellent planks for ship-building. It is also used for masts.—Somewhat resembling this in botanical characters is the Scrub Pine, or Gray Pine (*P. Banksiana*), generally only 3 to 10 ft. high, which begins to appear in the northern parts of the United States upon high mountains, and is interesting as an arctic species, extending further north than any other.—The Yellow Pine (*P. variabilis*, or *P. mitis*) abounds in the Atlantic states from New Jersey to Virginia. It is a tree of 50 to 60 ft. high, 15 to 18 in. in diameter at the base, with leaves 4 to 5 in. long, usually in pairs, but sometimes in threes upon the younger shoots. The timber is very extensively used for ship-building, and is largely exported to Great Britain. At Liverpool it is known as New York Pine.—The Jersey Pine, or Scrub Pine (*P. niops*), abounds in the lower parts of New Jersey, and thence to the s.w. The leaves are in pairs, 1 to 2 in. long, the cones armed with strong spines. The tree is rarely 30 or 40 ft. high. Great quantities of tar are made from it in Kentucky.—The Pitch Pine (*P. rigida*) is a native of the northern and middle parts of the United States, often growing in great miry swamps, and attaining a height of 70 to 80 ft., and a diameter of 2 ft. at the base. The leaves are in threes, varying much in length, as the cones do in size. Immense quantities of it are used for fuel. Tar and lamp-black are sometimes made from it.—The Loblolly or Old Field Pine (*P. Tæda*) grows in dry and sandy soils from Delaware and Virginia, southward, along the coast, often occupying lands exhausted by cultivation. Vast tracts never cultivated, in the Southern states, are *pine barrens*, in great part covered with this species of pine. It attains a height of 80 ft. and upwards, and has a wide-spreading crown. The leaves are 6 in. long, in threes, sometimes in fours on young branches; the cones 4 in. high, with strong spines. The timber is not of much value.—The Long-leaved Pine, or Southern Pine (*P. palustris*, or *P. Australis*), is perhaps the most important of North American forest trees. It furnishes the greater part of the tar, resin, pitch, and turpentine used in the United States. The timber is also very valuable, and is much used for ship-building. In England and the West Indies it is known as Georgia Pitch Pine. The tree attains a height of 60 to 70 ft., and a diameter of about 16 to 18 in.; the leaves are in threes, and about a foot long; the cones 7 to 8 in. long, and 4 in. in diameter, with small spines. The seeds are sometimes eaten.—The Weymouth Pine, or White Pine (*P. Strobus*), attains a height of 150 ft., and a diameter of 5 ft. and upwards. It has lax sub-triangular leaves in groups of five; and pendulous cones 4 to 5 in. long, with thin smooth scales. It is frequently planted in Britain and on the continent of Europe for its beauty. In its native country it abounds chiefly from lat. 47° to lat. 43°, and southward on the Alleghanies. The timber is not strong, but easily wrought and durable.—Of the species

belonging to the n.w. parts of America, one of the most magnificent is *P. Lambertiana*, which is found on the Rocky mountains, between lat. 40° and lat. 43°, chiefly in sandy soils. It attains a height of 150 to 200 ft., and a diameter of 7 ft. and upwards, almost to 20 feet. The trunk is remarkably straight, and destitute of branches for two-thirds of its height; the leaves in fives, the cones upwards of a foot long. The timber is white, soft, and light; and the tree produces great quantities of a pure amber-colored resin, which, when the wood is partly burned, is changed into a somewhat saccharine substance, used by the natives as a substitute for sugar. The seeds are eaten either roasted or pounded into coarse cakes.—*P. flexilis* is found on the Rocky mountains, near the head-waters of the Arkansas, and occurs almost to the limit of perpetual snow. It has a dense crown, formed of numerous and remarkably flexile branches. The leaves are in fives. The seeds are used as food by hunters and Indians.—*P. ponderosa*, another native of the Rocky mountains, is a magnificent tree, remarkable for the heaviness of its timber, which almost sinks in water. The leaves are in threes, and 9 to 14 in. long.—*P. Sabiniana*, *P. Coulteri*, and *P. insignis* are also noble species from the w. of North America. The Himalaya mountains abound in pines, some of which rival in magnificence those of n.w. America. The Bhotan Pine (*P. excelsa*), much resembling the Weymouth pine in its botanical characters, and attaining a height of 90 to 120 ft., abounds in Bhotan, although it is not found in the neighboring countries of Sikkim and Nepaul. The wood is highly valuable, being durable, close-grained, and so resinous as to be used for flambeaux and candles.—The Cheer Pine (*P. longifolia*) of India is a tree of remarkable and most graceful appearance; with leaves in threes, very long, very slender, and generally pendulous. It is abundant on the crests of hills in the lower Himalaya, growing at a lower elevation than the other pines. It is cultivated in some parts of India as an ornamental tree. It is much valued for its resin. The wood is used in India as a substitute for European deal.—The Khasia Pine (*P. Khasiana*) is peculiar to the Khasia mountains, and has very much the general appearance of the Scotch pine.—*P. Gerardiana*, a species with leaves in threes, is a large tree, a native of Nepaul. The seeds are eatable.—The mountains of India and the n.w. parts of America produce numerous other species; Mexico has a number of very fine ones peculiar to itself; the mountains of St. Domingo have one; the Canary islands have one; China and Japan also have some. Most of those which have been named, and a number of others, are now readily to be procured in nurseries in Britain, although some of them only at prices which prevent any attempt at extensive plantation. Some wealthy noblemen and gentlemen devote a portion of their grounds to a collection of different kinds of pine, called a *Pinetum*. A few foreign species have become pretty common in plantations. Most of the pines are quite hardy in Britain, but this is not the case with the cheer pine and some of the Mexican species. The name pine is often popularly extended, and even in scientific works, to other *coniferæ*.

Pine-timber.—This term is in general use for the timber of the pine-tribe (see Coniferæ), and is not confined to that of the genus pinus, but embraces the wood of species of abies, larix, Araucaria, dammara, etc. From the Baltic ports we receive red and white pine, or deal-timber. The former is yielded by the Scotch fir (*pinus sylvestris*), and the latter by the spruce fir (*abies excelsa*). These two, with the larch (*larix Europæa*), yield the greatest part of the pine-timber of Europe. Next in importance to these is the pine-timber of the British North American colonies, which is chiefly yielded by the Weymouth or white pine (*pinus strobus*), although, doubtless, the wood of other coniferous trees is often substituted for it. It makes excellent masts; but is not so serviceable for large timbers, as it is subject to dry-rot. The wood has a peculiar odor. Red pine is found from Canada to Pennsylvania; it is intermediate for durability between white pine and pitch-pine. (For *Redwood*, see Puget Sound.) In 1881, Canada exported to Great Britain timber to the value of £3,876,645. The celebrated pitch-pine of Savannah, in the southern states is the produce of *pinus rigida*. It is much used for ships' masts and yards, and for all purposes requiring great strength and durability, in both of which qualities it excels most others of its kind. The kinds above mentioned are those which constitute the greater part of the pine-timber used in ship and house building, carpentry, etc., in Great Britain. In France the timber of the Corsican pine (*pinus Laricio*) and the seaside pine (*pinus pinaster*) are greatly used. In Italy the pine-timber is chiefly yielded by the stone pine (*P. pinea*) and the Calabrian pine (*P. Bruttia*); that of Spain is from the Pyrenean pine (*P. Pyrenaica*). In Germany, and especially in Austria, the black pine (*P. Austriaca*) furnishes the greater portion; but the fine-grained, soft white pine, or deal, so much used for sounding-boards of musical instruments, is the wood of the silver fir. See Fir. The trade in this timber is very great, for not only do the Germans use it almost exclusively in their vast toy-manufactories and for lucifer-matches, but considerable quantities are exported. The finest is cut in the forests of Bohemia, where large establishments are formed for dressing and preparing the wood for various purposes.

The timber of the Norfolk island pine (*Araucaria excelsa*) is sometimes imported for making ships' masts, as several other kinds of pine-timber are imported from time to time, but those mentioned form the great staples of the timber-trade. The chief value of this class of timber-woods is in the combination of lightness and strength, with softness of texture and ease in working with ordinary tools; they constitute, in fact, the

principal materials of our builders, and are more used than all other kinds of wood together. Much confusion prevails as to their common designations, for in this country alone *fir*, *pine*, and *deal* are terms applied to all and each of them, according to the caprice of the individual. The two first names are used because the material is derived from one or other of those genera; but the last is a misnomer altogether, as the term deal belongs only to pieces of fir or pine timber cut to particular sizes: they are 3 in. in thickness, 9 in. broad, and of variable length; if of less width they are called *battens*.

PINE, a co. in e. Minnesota; divided from Wisconsin on the s.e. by St. Croix river; traversed by the St. Paul and Duluth railroad; drained by the Kettle and Snake rivers, and smaller streams; 1400 sq. m.; pop. '90, 4052. The surface is undulating, and extensively covered with pine trees of large size and other evergreen trees. The soil is heavy, and but little cultivated. Lumber is the chief product. Co. seat, Pine City.

PINEAL BODY, is a small, reddish-gray body, of a conical form, and deriving its name from its resemblance to the fruit of the pine. It rests upon the corpora quadrigemina of the brain, in front of the cerebellum. It is about four lines in length, and from two to three in width at its base. It is larger in the child than in the adult, and in the female than in the male. It consists chiefly of gray matter, and in its base is a small cavity, which contains a transparent viscid fluid, in which are granules composed chiefly of phosphate and carbonate of line, and termed *acervulus cerebri*. This organ was regarded by the ancients as the seat of the soul.

PINE-APPLE, or ANANAS, *Ananassa sativa*, a plant of the natural order *bromeliaceæ*, highly esteemed, and much cultivated for its fruit. The fruit is a *sorosis*, formed by the calyces and bracts of a close spike of flowers, becoming succulent and combined. This is the distinctive character of the genus *Ananassa*. The pine-apple has a number of long, serrated, sharp-pointed, rigid leaves, springing from the root, in the midst of which a short flower-stem is thrown up, bearing a single spike of flowers, and, therefore, a single fruit. From the summit of the fruit springs a crown or tuft of small leaves, capable of becoming a new plant, and very generally used by gardeners for planting; the pine-apple, in cultivation, being propagated entirely by crowns and suckers, as, in a state of high cultivation, perfect seed is almost never produced. The pine-apple is a native of tropical America; it is found wild in sandy maritime districts in the n.e. of South America, but it has been very much changed by cultivation. It has also been gradually diffused over tropical and subtropical countries, and not only as a cultivated plant, for it is fully naturalized in many parts both of Asia and Africa. It delights in a moist climate, and consequently does not succeed well in the dry climate of the s. of Italy, although the warmth is sufficient. The first particular account of the pine-apple was given by Oviedo in 1535. It was in Holland that it first began to be cultivated in hot-houses; but it was introduced into England in the end of the 17th c., and its cultivation rapidly became general in the gardens of the wealthy. It is only since the peace of 1815 that it has received similar attention in continental Europe. Great care is requisite in the cultivation of the pine-apple, which, without it, is generally fibrous and coarse, with little sweetness or flavor; and with it, one of the most delicate and richly flavored of fruits. Its size also very much depends on cultivation. The size varies from 2½ lbs. to 12 lbs. in weight. The pine-apples grown in British hot-houses are generally much superior to those of the West Indies, because the latter grow almost or altogether without cultivation; but the importation of pine-apples from the West Indies having now been carried on to a considerable extent, and promising to add to the sources of wealth for these colonies, has led to greater care in cultivation there, and consequent improvement of quality.

In the cultivation of the pine-apple in Britain, a tropical heat must always be maintained. It is generally cultivated in hot-houses specially appropriated to it, called *pineries* or *pine-stoves;* sometimes also in flued pits; and sometimes even without fire-heat, in frames continually supplied with fresh tanners' bark and dung. The universal practice, till of late, was to grow the plants in pots, plunged to the requisite depth in tanners' bark or other fermenting matter, and these were transferred from one house or one compartment to another, according to their stage of advancement; three years' culture being deemed requisite from the planting of a crown or sucker to the production of the ripe fruit; but the pine-apple is now often planted in beds, and fruit of the best quality is sometimes obtained in 15 months. The best soil is a rich and rather sandy loam. It is often formed from the turf of old pastures, with dung, peat, sand, etc., thoroughly mixed. Ventilation must be freely allowed from time to time, but care must be taken to keep the atmosphere moist. A pine-apple which has borne fruit is thrown away as useless.

There are many varieties of the pine-apple in cultivation. Of these, some are referred by some botanists to distinct species. But the greater number of varieties are universally referred to *A. sativa*, and differ in the more or less spiny serratures of the leaves, the globular, cylindrical, or pyramidal fruit, its size, etc.

A spirituous liquor (*pine-apple rum*) is made from the pine-apple in some warm countries.

The use of the fiber of the pine-apple is noticed in the article BROMELIACEÆ.

PINE-CHAFER, or PINE-BEETLE, *Hylurgus piniperda*, a small coleopterous insect of the family *xylophagi*. See BARK-BEETLE. It is often very destructive to Scotch firs in rich soils and low situations, attacking the young terminal shoot in summer, and soon eating its way into the heart, which it proceeds to excavate so as to convert the shoot into a tube. Pines growing in open situations are little liable to its attacks.

PINE-FINCH, or PINE GROSBEAK, *Corythus*, a genus of birds of the family *fringillidæ*, nearly allied to bullfinches and crossbills, the bill nearly resembling that of the former, but the tongue very similar to the tongue of the crossbills, with the same peculiar bone articulated to the hyoid bone. See CROSSBILL. One species, the COMMON PINE-FINCH, (*C. enucleator*), is a very rare visitant of Britain, but is abundant in many of the northern parts of Europe, Asia, and America. It is larger than a bullfinch, but much resembles the bullfinch in form, wings, tail, etc. The general color of the male is red. This bird frequents pine-forests, and associates in flocks in winter. It is easily tamed. Its song is rich and full.—There are other species in the northern parts of the world.—The name pine-finch is given in North America to a very different and much smaller bird (*carduelis pinus.*)

PINEL, PHILIPPE, a celebrated French physician, was b. April 20, 1745, at Saint-André, in the department of Tarn, France; and after receiving a good classical education at the college of Lavour, removed to Toulouse, where he studied medicine, and took his degree in 1773. He continued his medical studies at Montpellier, maintaining himself meantime by teaching mathematics; and in 1778 removed to Paris, where he acquired some reputation by a translation into French of Cullen's *Nosology* (1785), and the works of Baglivi (1788), and also by some memoirs on subjects connected with zoology and comparative anatomy. Having applied himself with success to the study of mental alienation, he was charged, in 1791, to make a report on the insane inmates of the Bicêtre, became chief physician of this institution in 1793, and in 1795 was chosen to the same office at the Salpêtrière (a similar asylum, but for females). In the latter institution Pinel commenced a class of clinical medicine, which he continued after his appointment to the chair of medical physics and hygiene, and subsequently that of pathology, at the school of medicine in Paris. He was admitted as a member of the institute in 1803, and died at Paris, Oct. 26, 1826. His most valuable works were his *Traité Medico-philosophique de l'Alienation Mentale* (1791), and *La Nosographie Philosophique* (1798), with its commentary, *La Médicine Clinique* (1802). Pinel gained for himself undying fame by his reformation of the old barbarous methods of treating the insane. The physicians brought up under the old system were not ashamed to offer a vigorous opposition to Pinel's philanthropic opinions; but he fortunately succeeded in thoroughly establishing their correctness.

PINERO, ARTHUR WING, dramatist, b. England, 1855. Studied law, which he abandoned for the stage, appearing as an actor in Edinburgh in 1874. His first attempt at play writing was in 1876, with *Two can Play at that Game.* He has also written *The Money Spinner* (1880); *The Squire* (1881); *Lords and Commons* (1883); *The Rocket* (1883); *The Magistrate* (1885); *The Schoolmistress* (1886); *The Hobby Horse* (1886); *Sweet Lavender* (1888); *The Profligate* (1889); *Lady Bountiful* (1891); *The Amazons* and *The Second Mrs. Tanqueray* (1893); *The Princess and the Butterfly* (1897), etc.

PINEROLO, or PIGNEROL, a t. in the n. of Italy, on the Clusone, at the entrance of the valley of Perosa, in the province of Turin, and 22 m. by railway s.w. of the city of that name. It was formerly strongly fortified. Pop. 12,281, comm., 17,492.

PINES, ISLE OF, in the s. Pacific ocean, a dependency of New Caledonia, and belonging to Spain; 12 m. in circumference, situated in lat. 22° 38′ s., long. 167° 25′ e.; population, about 2,500. The original inhabitants were cannibals, and of the same race as those of New Caledonia. The surface is mostly barren, excepting a wide strip surrounding the shore, which is fertile, and on which a few Europeans have settled. The island was discovered by Capt. Cook, in 1774, and is surrounded by smaller islands heavily timbered with valuable wood, which is exported. In 1872 it was chosen as a penal station by France for convicts, and many connected with the communal insurrection of 1871 have been placed there. The mountain of N'gu, 872 ft. high, is in the s.e. portion, and is a prominent landmark.

PINE SNAKE, *Pituophis melanoleucus*, a large serpent, found in the s.e. United States, 6 ft. long, 2 in. thick, of a glistening creamy-white color, blotched with dark brown. It is a beautiful variety of snake, and harmless to man. It derives its name from the pine lands in which it is found, emits a strong disagreeable odor, and feeds on eggs, birds, and small mammals. It makes a loud bellowing noise which has given it the name of bull-snake.

PINE-TREE STATE. See STATES, POPULAR NAMES OF.

PINE-WOOL. Several attempts have been made of late years to utilize the leaves of pine and fir-trees, which are cut down in vast numbers for their timber only. The leaves contain a considerable quantity of fine vegetable fiber, which, when separated, has much the appearance of cotton. In Germany, several works have been established for preparing this fiber, and fitting it for various applications; and, under the name of pine-wool, it is now sold for stuffing cushions, making wadding, etc. The principal

manufacture is near Breslau in Silesia, where it is carried on by the inventor, Herr Pannewitz.

PINEY TREE. See CALOPHYLLUM.

PINEY-VARNISH. See DAMMAR.

PINGRE, ALEXANDRE GUI, 1711–96; b. Paris; educated at a convent in Senlis. He at first taught theology of the Roman church; but becoming a believer in the Jansenist doctrines, turned his attention to astronomy. Between 1760 and 1776 he went on a number of scientific expeditions for the observation of stellar transits. He calculated the orbits of 24 comets, published *Cometography, or a Historical Treatise on Comets* (1783); a series of nautical calendars, and a translation of the *Astronomica* of Manilius (1786). He also computed the eclipses for the thousand years before the Christian era.

PINGUIC'ULA. See BUTTERWORT.

PING YANG, OR PIENG-AN, the n.w. province of Korea, bordering on Mantchuria, having its capital city of the same name. The province is bounded on the w. by the Yalu river and the Yellow sea. The only legal place of ingress and egress from China or elsewhere, or out of Korea, is at the t. of Ei-chiu on the Yalu river.

The city of Ping Yang lies on the n. bank of the Ta-dong river, 36 m. from its mouth. It is a place of great commercial and historical importance, and was the capital and royal residence until 1392. Besides suffering many sieges, it was the scene of a great battle between the invading Japanese and the army of succor sent by the Ming emperor from China to the Koreans, in 1593. On Aug. 6, 1866, the heavily-armed (private) American schooner *Gen. Sherman* entered the Ta-dong river on a semi-piratical trading expedition—the venture of an Englishman at Tien-tsin, who also held the post of U. S. vice-consul. The exact truth of the details is unknown; but the entire crew, consisting of three Americans and two British citizens, with nineteen Malay and Chinese sailors, were killed, and the vessel was burned. By orders from Washington, Commander R W. Shufeldt in the U. S. steamship *Wachuset* went over to the coast of Korea, arriving January 23, and waited in the approach to the Ta-tong river for nearly a week, communicating with the authorities. His demand that "the murderers of the crew of the *Gen. Sherman* be produced upon the deck of the *Wachuset*" was answered by the repeated invitation, "Please go away as soon as possible." After a survey of the inlet, the *Wachuset* returned to Chifu. In May, 1868, the U. S. steamship *Shenandoah* also visited the Ping Yang inlet, and Commander J. C. Febiger learned from the natives the circumstances attending the slaughter of the foreigners, by which it appeared that the latter were mistaken for "Frenchmen" (see KANG-HOA), and put to death after insults offered to the officials. Finding it impossible to obtain satisfaction, the United States government, not believing the Korean version of the affair, dispatched in 1871 the naval expedition which destroyed the forts along the Han river leading to Seoul the capital. See KANG HOA.

PIN HOLE PHOTOGRAPHY. See PHOTOGRAPHY.

PINK, *Dianthus*, a genus of plants of the natural order *caryophyllaceæ*, of which there are many species, annuals and perennials, with beautiful and often fragrant flowers, chiefly natives of Europe and the temperate parts of Asia. The calyx is tubular, 5-toothed, with two or four scales at the base; there are 5 petals suddenly contracted at the throat of the corolla into a linear claw. There are 10 stamens, and one germen with two styles. The capsule is cylindrical, and one-celled. The exquisite beauty of the flowers has attracted admiration in all ages; and some of the species have long been much cultivated in gardens, particularly the GARDEN PINK and CARNATION (q.v.), which are often referred to one original, the CLOVE PINK (*D. caryophyllus*), a native of the s. of Europe, growing wild on rocks and old walls, and naturalized in some places in the s. of England; while some botanists refer the garden pinks in part to the MAIDEN PINK (*D. deltoides*), a pretty common British species, and those called pheasant-eye pinks to the FEATHER PINK (*D. plumarius*), a native of some parts of continental Europe, differing from the clove pink chiefly in having the leaves rough on the margin, and the petals bearded and much cut. Nearly allied to them is *D. superbus*, found in moist places in some parts of Europe, and not unfrequently to be seen in flower-borders. It has very fragrant flowers. All the varieties of garden pinks, whatever their origin, have been much changed by cultivation, and careful cultivation is requisite to preserve them in perfection. Both single and double pinks are generally propagated by *pipings*, which are short cuttings of the younger shoots. They are also sometimes propagated by layers. A rich loamy soil is the best for pinks. The clove pink, in a wild state, has flesh-colored flowers. The leaves are linear-awl-shaped, grooved, and glaucous. The maiden pink is a small much-branched plant, growing in grassy places, on gravelly and sandy soils; it has rose-colored flowers spotted with white, and a white eye encircled by a deep-purple ring.—The Deptford pink (*D. armeria*) and the CLUSTERED PINK, or CHILDING PINK, (*D. prolifer*), also natives of England, differ from these in being annuals, and in having clustered flowers.—The BEARDED PINK, or SWEET WILLIAM (*D. barbatus*), a native of the middle of Europe and the s. of France, with lanceolate leaves, flowers crowded in dense clusters at the top of the stem, acuminated bracts, and bearded petals, has long been a

favorite garden flower, still retaining its place alike in palace and cottage gardens. Although perennial, it is sown annually by florists, to secure fine flowers, and there are many varieties, single and double, exhibiting much diversity of color.—The INDIAN PINK or CHINA PINK (*D. chinensis*) is now also common in flower-gardens.

PINK COLORS, very light shades of rose-red color: they are usually produced by extreme dilution of cochineal or carmine, Brazil and Braziletto wood colors, with whiting. Some mineral pinks for oil colors are obtained from preparations of manganese, etc. See RED COLORS. The term pink is also applied to several yellow colors (q.v.).

PINKERTON, ALLAN G. : 1819–84; b. Glasgow, Scotland; d. Chicago. He served an apprenticeship to the cooper's trade in Scotland, and in 1842, becoming involved in the Chartist outbreak in Birmingham, emigrated to the U. S., and settled in Ill., where, from a love of adventure, he secured the arrest of a band of counterfeiters, and was appointed deputy-sheriff. In 1852 he established a detective agency at Chicago. In the spring of 1861 he kept within reach of Mr. Lincoln on the way from Ill. to Washington, and during the civil war, under the disguise of "Major E. J. Allen," he superintended the secret-service division of the army. His personal exploits were material for romance. His specialty, if he had a specialty, for he was very versatile, was the detection of great bank and express robberies, and the running down of lawless bands. He wrote and published *Thirty Years a Detective, The Spy of the Rebellion, Professional Thieves and the Detective*, etc.

PINKERTON, JOHN, an industrious and learned *littérateur*, was born at Edinburgh, Feb. 17, 1758, and educated at the grammar-school of Lanark, where he was noted for the unusual excellence of his classical attainments, and for his hypochondriacal tendency. He was afterward apprenticed to a writer to the signet, his father refusing to let him proceed to the university; and while engaged in the irksome and distasteful practice of law, he published an *Ode to Craigmillar Castle*, in 1776, which he dedicated to Dr. Beattie. In 1780 he went to London, where he settled as a man of letters. Next year he gave to the public a volume of *Rimes* (as he called his pieces), and a collection of *Scottish Tragic Ballads*, followed in 1783 by a second collection of *Ballads of the Comic Kind*—both of which subsequently appeared under the title of *Select Scottish Ballads*. They professed to be ancient, but many of them were really compositions—*forgeries*, some might say, of Pinkerton's own, and would hardly deceive a critical archæologist. In 1784 he published an *Essay on Medals*, which went through several editions, and long held a high place among books on numismatics; and in 1785 *Letters on Literature*, marked chiefly by a novel system of orthography (e.g., the use of *a* instead of *s* in forming plurals), intended to soften the harshness of the English language, and which was abused as heartily as it deserved. These *Letters* were, however, the means of introducing him to Walpole, through whom he became acquainted with Gibbon and other literary celebrities. Pinkerton's next publication was a most valuable one, *Ancient Scottish Poems never before in Print, from the MS. Collections of Sir Richard Maitland of Lethington, Knight* (2 vols. Lond. 1786). It was followed in 1787 by his once notable *Dissertation on the Origin and Progress of the Scythians or Goths*, in which, for the first time, appears that grotesquely virulent hatred of the Britanno-Celtic race—Scotch Highlanders, Welsh, and Irish—that reaches its climax in his *Inquiry into the History of Scotland preceding the Reign of Malcolm III.* (2 vols. Lond. 1790), where he affirms again and again, obviously with the extremest gusto, that the Highlanders are "mere savages, but one degree above brutes;" that they are just as they were "in the days of Julius Cæsar;" that "like Indians and negroes," they "will ever continue absolute savages," and that "all we can do is to plant colonies among them, and by this, and encouraging their emigration, try to get rid of them." But in spite of this extravagant truculence of speech, the *Inquiry* contains a great deal of important matter—rare and curious historical documents, some of which are to be found nowhere else in print. Pinkerton left England in 1802, and fixed his residence at Paris, where he died Mar. 10, 1826, after a life of hard literary work. His principal publications, besides those already mentioned, are *The Medallic History of England to the Revolution* (1790); *Scottish Poems* (3 vols. 1792), reprinted from scarce editions; *Inconographia Scotica, or Portraits of Illustrious Persons of Scotland, with Biographical Notes* (2 vols. 1795–97); *The History of Scotland from the Accession of the House of Stuart to that of Mary* (2 vols. 1797), valuable for its laborious investigation of original materials, but disfigured, in a literary point of view, by an imitation of the grandiose style of Gibbon; *Walpoliana*, a collection of his notes of his friend Horace Walpole's conversation, in 2 vols.; *The Scottish Gallery, or Portraits of Eminent Persons of Scotland, with their Characters* (1799); *Modern Geography* (3 vols. 1802–7); *General Collection of Voyages and Travels* (16 vols. 1808–13); *New Modern Atlas* (1809–15); and *Petralogy, or a Treatise on Rocks* (2 vols. 1811).

PINK EYE, a highly contagious fever, prevalent among horses; thought to be due to the presence in the blood of a specific virus. Its period of incubation is about three days. Loss of appetite, stiff joints, and a generally dull appearance are the first symptoms. About the fifth day the eyelids become swollen and very red, and a discharge comes from the eyes; the fever has now reached its crisis, and the temperature, which rises as high as 105°, begins to fall. At this stage the animal generally suffers from diarrhœa. The disease is not fatal unless the animal is old or in bad condition.

PINKNEY, Edward Coate, 1802–28; b. London; son of William; educated at St. Mary's college, Baltimore; joined the navy 1816, serving 8 years. He undertook to practice law, but had no success; tried without result to get a commission in the Mexican navy, and in 1827 began the publication of a political journal called *The Marylander.* He published in 1825 *Rodolph and other Poems,* a later edition appearing in the Mirror Library in 1844 entitled *Rococo,* with an introduction by N. P. Willis.

PINKNEY, William, ll.d., 1764–1822; b. Md.; admitted to the bar in 1786, and soon obtained a large practice. He was a member of the Maryland convention called in 1788 to ratify the U. S. constitution; served in the state council, house of delegates, and senate, and in 1796 went to England as commissioner under the Jay treaty. He returned in 1804, and the next year was made attorney-general of Maryland. In 1806 he was again sent to England as minister extraordinary, and he remained as minister resident, 1807–11. He was attorney-general of the United States, 1811–18, and served in the war of 1812 as commander of a volunteer corps, receiving a dangerous wound at Bladensburg. He was elected to congress in 1815, and appointed minister to Russia the next year. He entered the U. S. senate in 1819.

PINK ROOT. See Spigelia.

PIN-MONEY, in law, a sum of money paid annually by the husband to his wife to spend for her personal expenses. On the death of the wife her representatives cannot claim unpaid arrears. The husband is not at any time bound to pay the arrears for more than a single year. Pin-money given to the wife but not spent by her, upon the death of the husband, goes to his representatives, Pin-money, now practically obsolete in England, was never established as a custom in the United States. The name is said to have been derived from an old English tax assessed to supply the queen with pins.

PINNA, a genus of lamellibranchiate mollusks of the same family with the *pearl mussel* (*avieulidæ*), and having a shell of two equal wedge-shaped valves, closely united by a ligament along one of their sides. The mantle is closed on the side of the ligament; the foot is small and conical. The byssus is remarkably long and silky; and by it the species affix themselves to submarine rocks and other bodies, sometimes even to sandy or muddy bodies. The best-known species is *P. nobilis,* a native of the Mediterranean, the byssus of which was used by the ancients for fabrics, but chiefly as an article of curiosity, to which a great value was attached. It is still so used in Sicily and elsewhere.

PINNACE (from the Ital. *pinaccia,* a dimunitive of *pino,* a ship), was originally a small vessel, usually schooner-rigged, employed as tender to a large ship, for the purpose of communicating with the shore, etc. At present, however, the signification is limited to a large boat carried by great ships. It is smaller than the launch, but larger than the cutters; and is generally rowed "double-banked," by from ten to sixteen oars.

PINNACLE, an ornamental termination much used in Gothic architecture. It is of simple form in the earlier periods of the style, having a plain square or octagonal shaft and sloping roof or top, terminating with a finial; but in later examples the pinnacle is greatly developed, and becomes one of the most varied and beautiful features of the style. It is ornamented with shafts bearing canopies, and niches filled with statues.

PINNIGRADES, or Pinnipedes, a section of carnivora, comprising seals and walruses, in which the fore and hind limbs are short and expanded into broad, webbed swimming paddles. The hind feet are placed very far back, nearly in a line with the axis of the body, and somewhat incorporated with the tail by the integuments. The body is elongated and somewhat fish-like, covered with short fur or hairs, and terminated by a short conical tail. The five toes of each foot are united by the skin and form powerful swimming paddles. The tips of the toes are armed with claws, but they have little power for land locomotion, the typical seals being able only to drag themselves along when out of the water. The ears are small, often only indicated by apertures, which the animal can close under water. The dentition varies, but teeth of three kinds are always present. The canines are always long and pointed, and the molars have sharp cutting edges.

The pinnigrades include three families, the earless seals (*phocidæ*), the eared seals (*otaridæ*), and the walruses (*trichecidæ*). The *phocidæ* differ from the walruses by having incisor teeth in both jaws, and moderate-sized canines, and from the otaridæ by the absence of ears and inability to use the hind limbs on land. They are very numerous, being found in most seas of temperate and frigid zones, but are most numerous in the latter. Their principal food is fish, for holding and masticating which their teeth are adapted. They are much hunted for their blubber and skins. The eared seals, or *sea-lions,* differ from the typical seals by having small, conical ears, and in the greater use of the limbs, especially the hind limbs, so that they are enabled to execute a sort of walk. The sea-lions are chiefly found in the Pacific and southern Atlantic, s. of La Plata river. The third family of pinnigrades, or *trichecidæ* comprises only the walrus or morse, and is distinguished from the true seals by the dentition. According to Owen there are six incisors in the upper jaw, and four in the lower, but these are only present in the young animal, soon disappearing, with the exception of the outer pair of upper incisors. The upper canines are enormously developed into long tusks, often over 15 inches. The upper jaw has on each side three premolars and two molars, with flattened crowns, and the lower jaw has the same number of premolars and one molar on each side. See Morse, Otary, Seal.

PINNULE, in botany, a leaflet of a pinnate leaf, or of one which is bipinnate, tripinnate, etc. See LEAVES. The term is more frequently used, however, to designate the ultimate divisions of the fronds of ferns, when divided in the same manner. See illus., LYCOPODIACEÆ, Vol. IX.

PINSK, a t. of w. Russia, in the government of Minsk, surrounded by vast marshes called the Pinsk marshes, stands on the banks of the Pina, a branch of the Pripet, 752 m. s.s.w. of St. Petersburg, lat. 52° 7′ n., long. 26° 6′ east. It was founded in the 12th c., was conquered by the prince of Lithuania in 1320, was annexed, together with Lithuania, to Poland in 1569, and came at last into the possession of Russia in 1795. The trade of Pinsk, chiefly transit, has increased, especially since the opening of the Oghinsky canal, which connects the Dnieper and the Black sea with the Niemen and the Baltic sea. Many ships and barges enter and clear the port. Pop. '91, 32,158.

PINSUTI, CIRO, composer, b. in Siena, Italy, May 9, 1829; d. in London, March 10, 1888. He studied under his father and played in public at the age of ten. Subsequently he went to England where he studied the pianoforte and composition, and in 1845 entered the conservatorio of Bologna, where he became Rossini's favorite pupil. In 1848 he returned to England and gave singing lessons in London and Newcastle. He was also professor of singing at the Academy of Music in London. His compositions include operas, pianoforte pieces, and many songs, choruses, and part songs, upon which his fame chiefly rests.

PINT, a measure of capacity used both for liquids and dry goods, and equivalent to the eighth part of a gallon (q.v.), or 34.65925 cubic inches. The Scotch pint, still in use, though superseded as a legal measure by the imperial pint, is equivalent to 3.00651 imperial pints.

PINTAIL, or PINTAIL DUCK, *Dafila*, a genus of ducks, of the section with the hind toe destitute of membrane. The bill is without tubercle at the base, narrow, with laminæ not projecting beyond the margin. The tail of the male is long, and tapers to a point.—The COMMON PINTAIL (*D. acuta*) is a handsome bird, rather longer in shape than most of the ducks; the neck also longer and more slender. It is about equal in size to the mallard. The head is brown, with a white longitudinal line on each side extending down the neck; the back and sides marked with waving lines of black and grayish-white; the lower parts white; the elongated central tail-feathers black. It is a native of all the northern parts of the world, migrating southward in winter, and a regular visitant of many parts of the British coasts. It also frequents fresh-water lakes and ponds, and is common in winter in the valley of the Mississippi. Its winter range extends southward to the Mediterranean and the gulf of Mexico, and even to Africa and the West Indian islands. Its flight is very rapid and noiseless. It is very much esteemed for the table.

PINTARD, JOHN, LL.D., 1759–1844; b. N. Y.; graduated at the college of New Jersey in 1776; studied but did not practice law; was a volunteer in the revolutionary war, and for three years a clerk to his uncle Lewis Pintard, commissioner for American prisoners in New York; edited *The Daily Advertiser;* afterward engaged in commerce; was for many years city inspector. He was the founder of the New York historical society, and vice-president of the American bible society.

PINTOS, a name applied to the people inhabiting the valley of the Mescala, in the state of Guerrero, Mexico, because they are liable to a disease which is produced, as it is thought, by some peculiar properties of the water of the Mescala, and resembles leprosy —the name Pintos (Sp.) signifying spotted. The people being mostly of Indian descent, the mistake has been made of supposing that the name Pintos applied to them as a tribe.

PINTSCH SYSTEM, a method of lighting railway cars by means of compressed gas obtained by means of distillation of petroleum. Ordinary coal gas when burned at the pressure of street mains, about one and one-half ounces, will give an illumination of about four candles per cu. ft. Oil gas at the same pressure will give about 16 candles per cu. ft. Compression and storage of gas, however, causes a loss in its illuminating power due to the deposition of the rich oily hydrocarbons. But this loss is much less in oil than in coal gas. At 125 lbs. pressure per square inch, one foot of oil gas would be equal in illuminating power to about 5 feet of coal gas. The outfit on the cars consists of one or two storage tanks, a pressure regulator, and a system of piping to the lamps. The latter are of special design, each having from four to six flames arranged beneath a porcelain reflector, and the whole encased in a glass bell jar.

PINTURIC'CHIO, BERNARDINO (BERNARDINO DI BETTO BAGIO), 1454–1513; b. Italy; supposed to have been a pupil of Perugino. His most celebrated works were his ten frescos in the Siena cathedral. On these he is said to have had the assistance of Raphael. His "Discovery of the True Cross" was painted for the chapel of the church of Ara Cœli. Alexander VI. employed him in the decoration of the Vatican, 1473–96.

PINZON, FRANCISCO MARTIN, the youngest of three brothers, belonging to a wealthy Spanish family, known as bold navigators, who sailed with Columbus on his first voyage to America. Francisco acted as pilot to the *Pinta*, which was commanded by his brother Martin. Charles V. honored the family by conferring upon them the rank of hidalgos. Admiral Pinzon, who in 1863 was in command of the Spanish fleet which took possession of the Chincha islands, Peru, is a descendant.

PINZON, MARTIN ALONSO, b. about 1441, the head of an Andalusian family of Palos de Moguer. It was chiefly through the influence of the Pinzons that Columbus was

able to obtain crews for the vessels provided by the crown. Martin commanded the *Pinta*. After the discovery of San Salvador, he deserted Columbus with the view of obtaining fame by original discovery. He landed at the mouth of a river in Hispaniola, long called by his name, but now known as Porto Caballo, and carried off some of the natives; but was compelled to return them by Columbus, whom he encountered at sea. Pinzon was parted from his commander by a storm on the return voyage, and reached Bayonne. Believing that the admiral had been shipwrecked, he sent a full account of the discoveries to Ferdinand and Isabella, claiming more than his share of the credit. He arrived at Pinto on the same day as Columbus, was badly received by the court, and died the same year, 1493, it is said from mortification and dejection.

PINZON, VICENTE YANEZ, b. Spain abt. 1460; commander of the *Niña* on Columbus's first voyage. Under the general license granted by Ferdinand and Isabella to go on voyages of discovery, he sailed from Palos, in 1499, with four vessels. Sailing some 700 leagues, he crossed the equinoctial line, and, Jan. 28, 1500, discovered cape St. Augustine. He landed, and formally took possession of the territory in the name of Spain; but, on account of the hostility of the natives, he set sail to the n.w., passed the mouths of the Amazon and Orinoco, and arrived at Hispaniola in June. Two of his ships foundered in a storm, and he finally reached Palos, having spent his entire fortune in the enterprise. In 1501 he obtained the royal consent to settle and rule the territory which he had discovered, from a point n. of the Amazon to cape St. Augustine. He never, however, returned to that country, though he took part in expeditions which were sent out in 1506 and 1508, to discover the passage which Columbus imagined between the Atlantic and a s. ocean. He was the first European who crossed the equator in the western ocean, and the first to discover Brazil.

PIOMBI'NO, a principality now incorporated in the kingdom of Italy, lies along the Italian coast opposite the island of Elba, the greater part of which belonged to it. Its extent was about 132 English sq. m.; and its population, previous to its incorporation with the rest of Italy, about 25,000. Piombino was originally a fief of the empire, and, at the end of the 14th c., came into the possession of the family of Appiani, which, after ruling it for nearly 300 years, made way for a new dynasty, the family of Buoncompagni. This latter dynasty was mostly under the suzerainty of the neighboring states of Sardinia and Naples alternately. In 1801, the Buoncompagni family were expelled by Napoleon, and the principality given to his sister Elisa, the wife of Felice, prince Baciocchi; but the latter was ejected, and the old dynasty restored, by the congress of Vienna; the principality being then put under the suzerainty of Tuscany, whose grand-duke indemnified the Buoncompagni for their loss of sovereignty. It is now part of the province of Pisa, in the kingdom of Italy. The strait between Piombino and Elba is called the "channel of Piombino."

PIOMBO, FRA SEBASTIANO DEL, 1485–1547; b. Venice; educated for the musical profession, in which he attained great excellence in his youth; afterwards studied the rudiments of painting with Bellini; then became a pupil of Giorgione. For many years he painted after the designs of Michael Angelo, thus enhancing his reputation. His principal works are his "Pieta," in the church of the Conventuale at Viterbo; the "Transfiguration," and "Flagellation," in San Pietro in Montorio; and his "Raising of Lazarus," which is considered his masterpiece. Receiving from Pope Clement VII. the office of keeper of the papal signet, he assumed the monk's habit, and the title of Fra, or Frate del Piombo.

PIONEER, a military laborer employed to form roads, dig trenches, and make bridges as an army advances, and to preserve cleanliness in the camp when it halts. Formerly, the pioneers were ordinary laborers of the country in which the army was, impressed for military purposes; but now such persons are only brought in as auxiliaries, a few men being attached to every corps as a permanent body of pioneers.

PIOTRKÓW, a division of Russian Poland, adjoining Prussian Silesia, Warsaw, Kalisz, Kielce, and Radom; drained by the Warta and Pilica; 4730 sq.m.; population '90, 1,091,300. The surface is level, though somewhat hilly in the s., and the soil fertile.

PIOTRKOW, since 1867 the capital of one of the 10 governments into which Poland was then divided, is near the Warsaw and Vienna railway. It is one of the oldest Polish towns; here, in the 15th and 16th centuries, diets were held, and kings elected. In 1702 Piotrkow was burnt by the Swedes; in 1709 the Russians gained a battle here. Pop. '90, 28,600.

PIOZZI, MRS. (*née* HESTER LYNCH SALISBURY), who cannot be forgotten while the great Dr. Samuel Johnson continues to be remembered, was the daughter of John Salisbury, esq., of Bodvel, in Caernarvonshire, where she was born in the year 1740. Early introduced into the fashionable world of London, she charmed by her beauty and her lively manners; and, in 1763, was married to Mr. Henry Thrale, a rich brewer with a recognized position in society, and, at the time, one of the members for the borough of Southwark. Her acquaintance with Dr. Johnson, which speedily became an intimacy of the closest and most affectionate kind, began shortly after. Of all Johnson's many friendships this was, perhaps, in certain essential respects, the most

valuable to him. To Johnson, widowed and alone, and subject, as he had been throughout, to excesses of a frightful gloomy hypochrondria, which made life at times to him an almost intolerable burden, the society of Mrs. Thrale, and of the circle which she gathered round her, was a source of incalculable solace. Mrs. Thrale in particular, with her warm heart, and bright womanly intelligence, was always a comforting presence; and her unfailing cheerfulness and vivacity enlivened for him many an otherwise cloudy hour. Her married life, though prosperous, was not an eminently happy one, Mr. Henry Thrale, though always a pleasant and kindly gentleman, being no miracle of conjugal virtue. If Johnson owed her much, it may be surmised that the benefit was in some sort reciprocal, and that, by her affectionate reverence and solicitude for her sage, she a little consoled herself for the gentlemanly indifference of her husband. On the death, in 1781, of her husband, Mrs. Thrale retired with her four daughters to Bath, where, in 1784, she married Mr. Gabriel Piozzi, an Italian teacher of music. This *mésalliance*—as it was held—was deeply censured by all her friends, and so unreasonably excited the ire of Dr. Johnson in particular, that a rupture of friendly relations was the result. In the correspondence between them on the subject, it must be admitted the lady has much the better of the philosopher, whose tone of unmannerly rudeness gives some countenance to the good-natured suspicion of his friends, that he had an eye to the widow himself. Though the feud was ostensibly healed, the friends never again met; Mrs. Piozzi leaving England for Italy with her husband, and Dr. Johnson dying soon after. Some little time subsequent to his death she published an octavo volume, entitled *Anecdotes of Dr. Samuel Johnson during the last Twenty Years of his Life*, in which it seemed to the indignant Boswell and others, that her main intention was to take her little feminine revenge on the deceased for his outrage in the matter of Piozzi. This work she supplemented in 1788 by a collection of *Letters to and from Dr. Samuel Johnson*, in 2 vols. 8vo. Of works more properly her own may be mentioned *Observations and Reflections made in the Course of a Journey through France, Italy, and Germany* (2 vols. 8vo, 1789); *British Synonymy, or an Attempt at regulating the Choice of Words in Familiar Conversation* (2 vols. 8vo, 1794); and *Retrospection, or a Review of the most striking and important Events, Characters, Situations, and their Consequences, which the last Eighteen Hundred Years have presented to the View of Mankind* (2 vols. 4to, 1801)—books long since utterly forgotten, if ever they were at all read and remembered. Having survived her second husband, her own celebrity, and almost in some sort that of the great Dr. Johnson, with whom her name remains indissolubly connected, Mrs. Piozzi died at Clifton, near Bristol, on May 2, 1821. See Seeley's *Mrs. Thrale* (1891).

PIP, Chip, or Roup, a disease of poultry, often very fatal, particularly to chickens and turkey poults. It is very frequent also in young pheasants. Adult birds are, however, liable to it; and when it appears in a poultry-yard it often attacks many in rapid succession, so that it is regarded as highly contagious. It most frequently occurs in wet or very cold weather, and is generally described as a kind of catarrh, although perhaps it might more accurately be called a kind of influenza. It begins with a slight hoarseness and catching in the breath, which is followed by an offensive discharge from the nostrils and eyes, rattling in the throat, and an accumulation of mucus in the mouth, forming a "scale" on the tongue. The communication of the disease from one bird to another is supposed to take place through the contamination of the water in their common drinking-vessel, and therefore a bird affected with it should at once be removed from the rest. Castor-oil is freely administered by some poultry-keepers. Mrs. Blair, in *The Henwife*, recommends a table-spoonful, but without saying whether this dose is for a full-grown fowl or a young chicken. She recommends also a medicine composed of half a dram of dried sulphate of iron, and one dram of capsicum, made into 30 pills with extract of licorice, one pill to be given three times a day. This after a certain time is to be followed by another compound, of sulphate of iron, cayenne pepper, and butter. The eyes, nostrils, and mouth are to be washed with vinegar. In a work on poultry published in 1867 (*The Practical Poultry-keeper*, by L. Wright, London), it is especially recommended that the diseased birds should be kept warm; they are to be fed on oatmeal mixed with ale, and to get plenty of green food. In other respects, except as to the castor-oil, the treatment recommended nearly agrees with Mrs. Blair's; but the removal of the "scale" from the tongue is not regarded as necessary, because it will disappear of itself on the cure of the disease.—It is proper to mention that there is considerable confusion of nomenclature as to the disease of fowls, and that, by some writers, the mere symptomatic affection of the tongue is called *pip*, and the disease itself *roup*. The terms, however, are generally used in the same sense.

PIPA, a genus of batrachians, in general form resembling frogs and toads, and characterized by the very broad and triangular head, the sides of which are destitute of the glands (*parotoids*) so large in the true toads; the eyes small, and situated near the margin of the lower jaw; the ear concealed beneath the skin; the tongue merely rudimentary; the jaws destitute of teeth; the fore-feet not webbed, but divided into four fingers, each of which divides at the extremity into four small points, these again being minutely divided in a similar manner; the hind-feet five-toed and completely webbed; the larynx of the male extremely large—a triangular bony box, within which are two small movable bones for occasionally closing the entrance of the bronchi; the back of the female fur-

nished with numerous cells or pouches, in which the eggs are hatched, and the young undergo all their transformations till they have attained a form similar to that of their parents. These characters are so remarkable as to make the creatures of this genus objects of peculiar interest; but particularly the mode of rearing the young. It was at first supposed that the young were produced in some unusual way in the cells from which they were seen finally to emerge; but this is not the case. The eggs are deposited by the female in the ordinary manner, and are carefully placed by the male in the cells of her back, which close over them. When the young are ready to use their limbs they struggle out of the cells, to which they never afterwards return. The best-known species of pipa is that commonly called the Surinam toad (*P. surinamensis*), a native of Guiana and other warm parts of continental America, where it inhabits swamps and ditches, and is occasionally found in damp and dirty corners of houses. It is sometimes 7 in. long; its color is brownish-olive above, whitish below; the skin covered with small hard granules, mingled with occasional horny tubercles. The whole aspect of the creature is peculiarly hideous.

PIPE, a measure of quantity commonly employed in Portugal, Spain, France, and in some other countries which trade with these. It is used almost exclusively for wine and oil, and has a particular value for almost each locality. The pipe is called in England a butt, and is equal to two hogsheads, or half a tun. The pipe of Oporto is larger than those of Lisbon and of Spain in the proportion of 93 to 76. There are three different measures of this name in France; and there was formerly a pipe, a measure of capacity for dry goods, in use by the Bretons. But the pipe in England varies with the description of wine it contains: a pipe of port contains 114 imperial gallons; of sherry, 108 imperial gallons; and of madeira, 92 imperial gallons; while the common English pipe contains 126 wine gallons, or 105 imperial gallons nearly.

PIPE-CLAY is a fine clay (q.v.), free from iron and other impurities, having a grayish-white color, a greasy feel, and an earthy fracture. It adheres strongly to the tongue, and is very plastic, tenacious, and infusible. It is used for the manufacture of tobacco-pipes and white pottery. The localities where it is chiefly obtained are Devonshire, and the Trough of Poole in Dorsetshire. It is also found in various places in France, Belgium, and Germany.

PIPE-FISH, *Syngnathus*, a genus of osseous fishes of the order *lophobranchii* (q.v.), and of the family *syngnathidæ*. In this family the form is elongated, there is little flesh, and the body is almost covered with partially ossified plates; the head is long; the jaws are elongated so as to form a tubular snout—whence the name pipe-fish and *syngnathus* (Gr. *syn*, together, and *gnathos*, a jaw); and the males have pouches, variously situated, in which they receive the eggs of their mate, and carry them till they are hatched. The family *syngnathidæ* is sometimes restricted to those in which the egg-pouch of the males is on the tail, and is open throughout its whole length, and the tail is not prehensile. Thus restricted, it contains a number of genera, of which one only, *syngnathus*, is British.—One of the most common British species is the GREAT PIPE-FISH (*syngnathus acus*), which is sometimes found in deep water, and sometimes at low tide among the sea-weed in rock-pools. The specimens commonly seen are from 1 ft. to 16 in. in length; but this fish is said to attain a length of 2 or 3 feet. Its food, and that of the other species, is believed to consist of small marine animals and the eggs of fishes; and it may be seen slowly moving about, with curious contortions, poking its long snout into every crevice in search of food, and sometimes assuming a vertical position with the head downward, poking into or stirring the sand. This and the other pipe-fishes show great affection for their young, which are believed to return, on the appearance of danger, to the pouch of their male parent, after they have begun to leave it, and to swim about in the sea.

The name pipe-fish is sometimes also given to the fishes forming the family *fistularidæ* (q.v), or flute-mouths, sometimes called *pipe-mouths*.

PIPE LINES. Iron pipes for transporting oil from the wells to some certain destination. The first suggestion of such a mode was made by Gen. S. D. Karns, in Nov., 1860. His idea was to lay a line from Burning Springs to Parkersburg, and let the oil gravitate to the Ohio river, where it could be properly loaded and shipped. The distance was about 36 miles. For some reason the line was never laid. Several years afterward, a Mr. Hutchinson, inventor of the rotary pump which bears his name, conceived the idea of *forcing* oil through pipes, and his plans became a reality, the first pipe line being laid from the Sherman well to the railway, a distance of about three miles. Every preparation was taken to prevent the breaking of the pipes. Air chambers were built at intervals of every 50 or 100 feet. They were fashioned like the air chambers on force pumps. They were heavily built, being 10 inches in diameter, and were for the purpose of equalizing the pressure. They constituted a series of strange looking protuberances along the line and excited great curiosity, inasmuch as they gave the line the appearance of a fence, with highly ornamental posts, running through a wilderness of rocks, woods, hills, and valleys. The pipes were of cast iron, but the jointings proved to be imperfect, and through leakage, very little oil ever reached the end of the line. Although a success theoretically, the work was a mechanical failure.

The year 1865 witnessed the first successful laying of a pipe line. It extended from Pithole to Miller's farm, a distance of 4 miles, and was laid down by Samuel Van Syc-

kle, of Titusville. Late in the year of 1865, Henry Harley began a line from Benninghoff run to Shaffer Farm; a company was organized; the two lines consolidated, and were brought into successful operation under the name of the "Allegheny Transportation Company." When the prospects of success in the accomplishment of their undertaking became assured, the most determined opposition to the enterprise broke out and was entered into by an army of roustabouts and teamsters; personal violence was threatened to the proprietors; their oil tanks were burned; attempts made to destroy the pipes by breaking the joints, and workmen were brutally assaulted. Some detectives became teamsters, discovered the ringleaders, had them arrested, and the strife was at an end. The promoters of the enterprise were victorious.

The success having proved of such great value, the building of new lines was promptly entered upon, and so rapidly progressed, that in 1880 there was a complete network throughout the oil regions, with trunk lines to Pittsburg, Cleveland, New York, Williamsport, and other places, which since that time has increased, until every prominent city within the reach of the various companies has been connected with the "oil arteries" of the great Reservoir.

The trunk lines are laid from the wells to the great cities. They are laid in the forests and among the hills and valleys, across rivers, and are either entirely on the surface of the ground or only slightly covered.

The main lines are built of 6-inch pipe tested to a pressure of 2000 pounds to the square inch. The pipe is simply a monster gas pipe. Each well has a tank either of wood or iron, holding an average of 250 bbls. At the terminal station a "rack" is constructed that will hold from 1 to 20 cars, with a system of branch pipes laid with cocks. The tank cars run alongside, and every stream is opened, filling the whole train, whether few or many cars, in about an hour and thirty minutes. In 1884 the average number of barrels pumped through the pipe line daily was 64,784. The National Transit Co. controls 90 per cent. of all the Pipe lines. See Oil Wells and Oil Trade.

PIPERA'CEÆ, a natural order of exogenous plants, natives almost exclusively of the hottest part of the globe, particularly of Asia and America. None of them found in cold regions. About 600 species are known, to most of which the name Pepper is sometimes given, although some are also known by other names, particularly those of which the fruit is not used as a spice, but of which some part is employed for some other purpose, as betel, cubebs, matico, and ava. See these heads. But pepper (q.v.) is the most important product of the order. Of the piperaceæ, a few are almost trees; but they are generally shrubs or herbaceous plants, often climbing. They have jointed stems; opposite whorled or alternate leaves, with or without stipules, and insignificant greenish flowers in slender spikes, unisexual or hermaphrodite, the different kinds generally mingled in the same spike; the flowers without calyx or corolla, but each with a bract, the stamens 2 to 6, the ovary with one cell and one ovule, and crowned with one or three stigmas; the fruit somewhat succulent, containing one seed.

PIP'ERINE, $C_{17}H_{19}NO_3$, is an alkaloid possessing very weak basic properties, which is found in the pepper tribe. It may be obtained by heating powdered pepper with alcohol, which extracts the piperine and some resinous matter, which may be removed by digestion in a solution of potash. It occurs in colorless well-formed prisms, which are insoluble in cold water, but dissolve readily in alcohol and ether. According to Miller, piperine "has an acrid taste, resembling that of pepper;" while Gorup-Besanez asserts that "it is devoid of odor or taste, and that, consequently, the well-known properties of pepper are not dependent on it." On heating piperine with soda-lime, a remarkable oily base, *piperidine*, $C_5H_{11}N$, is obtained, with a pungent odor, resembling both that of ammonia and pepper.

PIPE ROLLS, the, or rolls of the Exchequer, are records of revenue beginning in the second year of Henry II. of England, and extending, with but two breaks—the rolls of the first year of Henry III. and the seventh year of Henry IV.—to 1833, when they were abolished entirely. The antigraph or roll of the chancellor's scribe supplies the place of the missing roll of Henry IV. One of this series of rolls that was long thought by some to be that of the first year of Henry II., and by others to belong to the fifth year of Stephen, has been recently decided beyond a peradventure to belong to the thirty-first year of Henry I., and this makes it the earliest national document of any extent that is now in existence, except Domesday-Book (q.v.). These records are among the most interesting and valuable documents of the public records of England. It is difficult to state just what these records contain; but they comprise in part everything pertaining to the early revenues of the crown,—e.g. rents of various kinds, fines, taxes of lands and tenements; also accounts of ancient revenues of the crown classified under the names of the different counties and "written up annually to the charging and discharging of the sheriffs and other accountants." The pipe rolls also contained accounts of goods seized by the crown, of the outlawry of any prominent man, or of his daughter's marriage; also names of most of the property holders in a county, and so making them of inestimable value to county historians or to pedigree-hunters. A Pipe Roll Society was established in 1883, which purposes to reprint the entire series of the pipe rolls.

The Pipe Roll of Cloyne was compiled in 1364 by Bishop Swaffham, and is considered a famous record. It gives a full and authentic account "of the feudal times of the

see, the nature of the impositions, and the duties the *puri homines Sancti Colmani* were bound to perform at a very early period." This record is now in the Record Office in Dublin.

PIPES. See Tobacco Pipes.

PIPES, or Tubes, are made of various materials and for various purposes. Thus, we have draining-pipes for agricultural and sanitary purposes, made of earthenware, wood, and metal; pipes of various kinds of metals for a great variety of purposes, and tobacco-pipes (q.v.) of various materials. Formerly, wooden pipes were extensively used for conveying water and for draining; but so great an improvement has been effected of late years in the manufacture of metal and earthenware pipes that they have now become exceedingly rare, and will soon disappear. For agricultural purposes, *drain-tiles* are made of ordinary brick-clay; and owing to the use of machinery in their manufacture, they are produced very rapidly and cheaply. They are of various sizes, but the most general is 15 in. in length by 2½ in. diameter. The operation of the drain-tile machine is to squeeze a continuous length of soft plastic clay through a ring-shaped orifice, the center of which is occupied by a core or mandrel of the size of the hollow part of the pipe. Another arrangement of the machine is to cut the pipe to the proper lengths as it passes through, and by means of a traveling-table, to carry them forward to be removed to the sheds, where they are dried, previous to being burned in the kilns.

Earthenware pipes are now made of almost every size, from an inch or two in diameter up to the enormous size of 54 inches. They are usually made of fire-clay, and are glazed like common pottery. See the article Pottery. They are wider at one end, so as to form a socket to receive the end of another, and thus form a continuous tube. These are greatly used for the drainage of houses, and for sewering, for which they are admirably adapted: the inner surface being glazed as well as the outer, offers no resistance to sedimentary matters, which are consequently carried away readily. These pipes are of such great strength, that many small towns in England are now sewered with them almost entirely. Another kind has been introduced for chimney flues. They are also made of fire-clay, but unglazed externally, and so thick that there is little fear of breaking. They are placed one on another, and are built into the walls of houses, instead of the ordinary chimneys, and in this way save much labor in building, and afford a much more effective, and easily cleaned flue. *Caoutchouc vulcanized* and *gutta percha* are also extensively used for making pipes for a variety of purposes, their flexibility rendering them very useful. *Leathern pipes* are used chiefly for the conveyance of water temporarily, as in the case of fire-engines: they are generally called *hose.* Metal pipes are made of iron, lead, tin, or an alloy of tin and lead, copper, brass, etc. Iron pipes are usually cast, and the manufacture of such pipes has become of enormous extent, in consequence of the vast works, by which almost all large towns in Great Britain and in many foreign states are now supplied with water and gas, the pipes for which are largely exported from Great Britain. A great proportion of the trade in cast-iron pipes is carried on in Scotland. The water-works which supply the great towns of Lancashire have nearly all been furnished with pipes from Scotland; and the magnitude of the supply can be best understood when it is known that for the Rivington pike works, which supply Liverpool, upwards of 20 m. of iron pipes, nearly 4 ft. in diameter, are required. It would be impossible to make a correct estimate, but it has been stated, with great reason for belief, that in Great Britain the gas and water pipes laid and in use exceed half a million of miles in length.

Pipes made from the ductile metals, such as brass, copper, and tin, are made by first casting an ingot of the metal into the shape shown in fig. 1, with a hole through its length of the same diameter the bore of the pipe is intended to have. Into this is placed an iron rod, called the mandrel (*a*, fig. 2), which exactly fits, and which projects slightly at the tapered end (*b*, fig. 2). It is then brought to the drawing-table, and here the small end with its projecting mandrel is put into a funnel-shaped hole, drilled through a steel post (*a*, fig. 3), so as to allow the point to be griped on the other side by a pair of pincers, at the end of a strong chain; the machine-power is then applied to the other end of the chain, and the soft metal and its mandrel are drawn through, the former being extended equally over the surface of the latter, which is then removed, and the length of pipe is complete. Some metals require repeated drawing through holes, getting gradually smaller, and have to be softened or annealed at intervals, as the metal hardens under repeated drawing. In this way, brass, copper, tin, and pewter pipes are made; and a patent has also been taken out for making steel ones; but lead pipes are made of great lengths by squeezing the soft metal through a hole in a steel plate in which there is a fixed

Fig. 1.

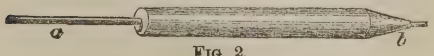


Fig. 2.

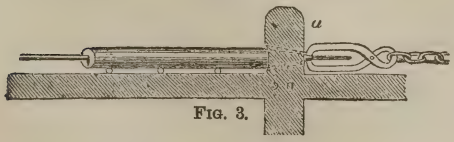


Fig. 3.

core or mandrel projecting, which forms and regulates the size of the bore of the pipe. Pipes are also made from copper, brass, and malleable iron by rolling out narrow strips of metal, and then passing them successively through rollers, which are deeply grooved, and which turn up the edges. A mandrel is then laid in it, and it is next passed through double-grooved rollers, which turn the edges in, and thus form a complete tube round the mandrel. The edges, however, require soldering or welding, if of iron. All boiler tubes used to be made in this way; but the method of drawing has lately been so much improved, that copper and brass pipes, or tubes, as they are frequently called, are now drawn of considerale thickness and diameter.

PIPE-STICKS. It is usual to call the wooden tubes used for some tobacco-pipes by this name; and unimportant as it may at first sight appear what the tube is made of, there is great difference of taste in this respect; and great care is taken by some smokers to get what they consider the choicest material. Perhaps the most prized are the agriot or cherry pipe-sticks of Austria. These are the young stems of the mahaleb cherry (*prunus mahaleb*), which is extensively grown for the purpose in the environs of Vienna. An astonishing amount of care is bestowed on the cultivation of these shrubs, which are all raised from seed. When the seedlings are two years old, they are each planted in a small pot, and as they continue to grow, every attempt at branching is stopped by removing the bud. As they increase in size from year to year, they are shifted to larger pots or boxes, and great care is taken to turn them round almost daily, so that every part is equally exposed to the sun. When they have attained a sufficient height, they are allowed to form a small bushy head, and continue to receive the same attention in daily turning, etc., until they are thick enough in the stem. They are then taken up, and the roots and branches removed, and the stem put by to season. Afterwards, they are bored through and are ready for use. These pipe-sticks have an agreeable odor, and are covered with a reddish-brown bark, which is retained. Sometimes they are 5 ft. in length, and as smooth and straight as if turned. When of such a length, they command high prices. In Hungary, pipe-sticks made from the stems of the mock orange (*Philadelphus coronarius*) are much used; and the jessamine sticks of Turkey are in great esteem in all countries. Orange and lemon trees and ebony are also used. The chief recommendation of these materials seems to be in the power of the wood to absorb the oil produced in smoking tobacco, and consequently to render the smoke less acrid. See TOBACCO-PIPES.

PIPESTONE, a co. in s.w. Minnesota, bordering on Dakota, drained by the Rock river and by the Big Sioux and its tributaries ; 460 sq.m. ; pop. '90, 5132. The surface is mostly rolling prairie. It is noted for its quarry of red stone, from which the Indians made their pipes, and which was regarded by them as sacred. Co. seat, Pipestone.

PIPI, the name given to the ripe pods of *Cæsalpinia papai* (see CÆSALPINIA), which are used in tanning, and are not unfrequently imported along with dividivi (q.v.), and sometimes separately, but not to any considerable extent, being very inferior to dividivi. They are easily distinguished from the pods of dividivi, not being curved as they are, but straight.

PIPING CROW. See BARITAH.

PIP'IT, TITLING, or TITLARK, *Anthus,* a genus of birds included by Linnæus among larks (*alauda*); but now regarded as forming even a distinct family, *anthidæ*, which is ranked among the *dentirostres*, whilst the lark family (*alaudidæ*) is ranked among the *conirostres*. The bill is more slender than in larks; the tips of the mandibles slightly bent downwards and notched. The hind-claw is long, although not so long as in larks, and more or less curved. The plumage resembles that of larks; in habits and motion of the tail, there is a greater resemblance to wagtails. The bill is not strong enough for feeding on grain or hard seeds, and insects and worms are the principal food of pipits. The most common British species is the MEADOW PIPIT, COMMON TITLARK, or TITLING (*A. pratensis*), familiarly known in many parts of England and of Scotland as the *moss-cheeper*. It is found in almost all parts of Europe, and the n. of Asia, in western India, in Japan, and in Iceland. It is a small bird, its color brown of various shades. It frequents heaths, mosses, and pastures; and usually makes its nest on a grassy bank, or beside a tuft of grass or heath. Its song is weak and plaintive, and it generally sings in the air. It is gregarious in winter. The cuckoo is said to deposit its eggs more frequently in the nest of the meadow pipit than in that of any other British bird.—A rather larger British species is the TREE PIPIT, or FIELD TITLING, which has a shorter claw, and perches on trees, frequenting inclosed and wooded districts. It is a summer visitant of Britan, and most common in the s. of England. It occurs in most parts of Europe, in Asia, and the n. of Africa.—The rock pipit, or SEA TITLING (*A. petrosus*), is to be found on the shores of all parts of Britain and Ireland. It is rather larger than the tree pipit, and has a long curved hind-claw. It feeds chiefly on small marine animals, seeking its food close to the edge of the retiring tide.

PIPPI. See GIULIO ROMANO.

PIPPIN (so called probably because raised from the *pip*, or seed), a name given to many varieties of apple, among which are some of the finest in cultivation, as the *Golden Pippin, Ribston Pippin*, etc. The ribston pippin was long supposed to be an originally

English variety, produced at Ribston Hall in Yorkshire, but it is proved to have been introduced from Normandy in the beginning of the 18th century.

PIPSISCEWA. See WINTERGREEN.

PIQUA, a city in Miami co., O.; on the Miami river, the Miami and Erie Canal, and the Pittsburg, Cincinnati, Chicago, and St. Louis, and the Hamilton and Dayton railroads; 28 miles n. of Dayton. It is built on a large plain, with broad streets; has excellent water power for manufacturing; and contains gas and electric light plants, street railroads, several national banks, the Schmidlapp free school with library, and rolling mills, corrugated iron works, and manufactories of stoves, ranges, bentwood goods, woolen goods, straw-board, furniture, and linseed oil, the last being its most important industries. Pop. '90, 9,090.

PIQUET, a game of cards played between two persons with 32 cards—viz., the four honors, and the highest four plain cards of each suit. The cards are shuffled and cut as in whist, and then dealt, two by two, till each player has 12; and the remaining 8, called the *talon*, or stock, are then laid on the table. The first player must then discard from one to five of his cards, replacing them with a similar number from the talon; and after him, the younger hand may discard if he pleases, similarly making up his proper number from the remaining cards of the talon. The player who first scores 100 wins the game, and the score is made up by reckoning in the following order—carte-blanche, the point, the sequence, the quatorze, the cards, and the capot. *Carte-balanche* is a hand of 12 plain cards, and counts 10 for the player who possesses it. The *point* is the greater number of cards in any suit, or, if the players are equal in this respect, that which is highest in value (the ace counting eleven, each court-card 10, and the plain cards according to the number of pips), and counts a number equal to the number of cards in the suit. The *sequence* is a regular succession of three or more cards in one suit, and the highest sequence (i.e., the one containing the greatest number of cards, or if the players have sequences equal in this respect, the one of the two which begins with the highest card), if of three cards, counts three; of four cards, four; of five cards, fifteen; of six cards, sixteen, etc. The *quatorze* is a set of four equal cards (not lower than tens), as four aces, four queens, etc., and the highest quatorze counts 14 for its holder; but should neither player have a quatorze, then the highest set of three is counted instead, but it reckons only three. The possessor of the highest sequence or the highest quatorze also counts all inferior sequences and quatorzes (including sets of three): while his opponent's sequences and quatorzes go for nothing. The first player reckons his points, and plays a card; the dealer then reckons his points, and follows his opponent's lead, and cards are laid and tricks are taken as in an ordinary card-game. Each player counts one for every card he leads, and the taker of the trick (if second player) counts one for it; the possessor of the greater number of tricks counting 10 in addition (the "cards"), or if he takes all the tricks, he counts 40 in addition (the "capot"). If one player counts 30—i.e., 29 by his various points, and 1 for the card he leads, before his adversary has counted anything, he at once doubles his score, reckoning 60 instead of 30 (this is called the "pique"); and should his score reach thirty before he plays a card, or his adversary begins to count, he mounts at once to 90 (the "re-pique").

PIQUÉ WORK, a very fine kind of inlaying with gold, silver, and other costly materials; it is, in fact, a kind of buhl-work (q.v.), carried out on a very minute scale. It is only applied to articles of small size, such as snuff-boxes, card-cases, and similar articles.

PIRANE'SI, GIOVANNI BATTISTA, 1720–78, b. Italy; studied architecture at Rome. In 1741 he brought out a work on triumphal arches and other antique architectural remains. The engravings in this work gave him a high reputation. He produced, in less than 40 years, nearly 2,000 engravings. His most important works are *Architectura Romana; Campus Martius;* a collection of *Ancient Statues and Busts;* and *Antiquities of Herculaneum and Pompeii.* Piranesi drew his subject upon the plate itself, and completed it by etching in aqua fortis. A selection of his engravings was published at Vienna in 1892.

PI'RACY is robbery on the high seas, and is an offense against the law of nations. It is a crime not against any particular state, but against all mankind, and may be punished in the competent tribunal of any country where the offender may be found, or into which he may be carried, although committed on board a foreign vessel on the high seas. It is of the essence of piracy that the pirate has no commission from a foreign state, or from one belligerent state at war with another. Pirates being the common enemies of all mankind, and all nations having an equal interest in their apprehension and punishment, they may be lawfully captured on the high seas by the armed vessels of any particular state, and brought with its territorial jurisdiction for trial in its tribunals. The African slave-trade was not considered piracy by the law of nations; but the municipal laws of the United Kingdom and of the United States by statute declared it to be so; and since the treaty of 1841 with Great Britain, it is also declared to be so by Austria, Prussia, and Russia.

PIRÆ'US (Gr. *Peiræus*), the principal harbor both of ancient and modern Athens (q.v.). Only a few traces remain of the long walls which formerly united it and Munychia with the capital city. The modern Piræus, which has sprung up since 1835, is a regularly laid-out town, with some good houses and shops, and a handsome stone exchange,

built at the expense of the municipality. It was in 1869 connected with Athens by a railway, and it has several spinning factories of recent construction. The harbor, called also Porto Leone or Drakoni, is both safe and deep; but the entrance is narrow. The harbor has an area of 500 acres, and the quayage is 1½ m. long. Pop. '90, 34,300.

PIRANO, a sea-port of Austria, in the market-grafdom of Istria, stands on a peninsula in the bay of Largone, 13 m. s.w. of Trieste. It contains an old castle, has a port and several dock-yards, commodious roads, in which large vessels find safe anchorage, and is the seat of considerable trade and commerce. Among its more important edifices are an interesting Gothic church, a town-house, and a minorite convent, with a number of good pictures. Wine and oil are made in considerable quantities, and there are salt-works in the neighborhood. Glass, soap, and chemical products are manufactured. Pop. '90, 7224.

PIRON, Alexis, 1689–1773; b. France; studied law at Besançon, but was unable to support himself in that profession. Going to Paris in 1719, he became secretary to Belle-Isle, the grandson of Fouquet. He soon began writing for the stage, and produced comedies and tragedies. Few of the latter have much merit. His best work is his comedy *La Métromaine*, which appeared in 1738. He was chosen a member of the academy in 1753, but the royal sanction was refused on account of a licentious ode which he had written in his 20th year. On this occasion Piron proposed this epitaph for himself:

Ci-git Piron, qui ne fut rien,
Pas même académicien.

PIRAYA, or **Pirai**, the name given in Guiana to *serrasalmo piraya*, and other species of *serrasalmo*, a genus of fishes of the family *characinidæ*, regarded by many as a section of *salmonidæ* (q.v.). The fishes of this genus, of which numerous species inhabit the rivers and other fresh waters of tropical South America, have a compressed and deep body, the belly keeled and serrated with a double row of hard serratures. They are extremely voracious fishes, and not only consume with great rapidity dead carcases thrown into the water, but attack living creatures very much larger than themselves, biting off the fins of large fishes, and then devouring them at leisure, often mutilating ducks and geese by depriving them of their feet, and venturing to attack even oxen and human beings. The latter, however, make reprisals on them, and find them very good food. *Serrasalmo piraya* seldom exceed 10 or 12 in. in length, but some of the species attain a considerably larger size. Some of them are very brilliantly colored. The Indians use the teeth for sharpening their arrows, made of the very hard ribs of palm-leaves, which they use for their blow-pipes, and which they sharpen to a very fine point by drawing them across a piraya's jaw, an article with which the Indian of Guiana is always provided; nor does the edge of the teeth soon begin to be worn. Pirayas are readily taken by a baited hook, and almost any kind of bait will do; but they at once cut through any line, and the line must therefore be cased above the hook in tin-plate.

PIRMASENS, a t. of the Bavarian palatinate, and formerly the chief t. of the county of Hanau-Lichtenberg, 30 m. s.w. of Spires. In 1895 it had 24,547 inhabitants; chief manufactures, shoes and musical instruments.

PIRNA, a small t. of Saxony, stands on the left bank of the Elbe, 11 m. by railway s.e. of Dresden. It is surmounted by a hill crowned by a castle, now used as a lunatic asylum, contains a beautiful parish church, and a number of important benevolent institutions. The manufacture of stoneware employs many hands. Pop. '95, 15,672.

PISA, a province of Italy, bounded on the n. by the province of Lucca, on the e. by that of Firenze, on the s. by that of Siena, and on the w. by the Mediterranean; drained by the Arno, Serchio, Cecina, and Era; intersected by railroads running to Leghorn, Florence, and Lucca; 1179 sq. m.; pop. '95, 309,915 (est.). The surface is varied, crossed in the central and n. parts by branches of the Apennines, and swampy in some other parts. The n. part is a wide plain, on which the city of Pisa is built. Corn, wine, fruits, flax, silk, and hemp are the chief products. Capital, Pisa.

PI'SA, one of the oldest and most beautiful cities of Italy, capital of the province of the same name, which formed part of the late grand-duchy of Tuscany, is situated on the banks of the river Arno, which intersects the city and is spanned by three noble bridges. Pisa is situated in 43° 43′ n. lat., and 10° 23′ e. long. The population was, in 1894, 63,400. It has broad, straight, well-paved streets, and several fine squares. Among its many churches, the most worthy of notice is the cathedral, or Duomo, begun in 1068, and completed in 1118, with its noble dome, supported by 74 pillars, and its fine paintings, variegated marbles, and painted windows. Near the cathedral stands the round marble belfry known as the leaning tower of Pisa, from the circumstance that it deviates about 14 ft. from the perpendicular. This celebrated building, which is 180 ft. in height, and consists of seven stories divided by rows of columns, and surmounted by a flat roof and an open gallery commanding a splendid view of the surrounding country, was erected in the 12th c. by the German architect Wilhelm of Innsbrück. See illustration, Italian Architecture, Vol. VIII., fig. 4. The baptistery, or church of St. John, opposite the cathedral, an almost equally remarkable structure,

was completed in 1162 by Diotisalvi. The main building, which is circular, and raised on several steps, supports a leaden-roofed dome, having a second dome above it, surmounted by a statue of St. John. The beautifully proportioned interior, noted for its wonderful echo, contains a pulpit, which ranks as the greatest masterpiece of Nicola Pisano, various pieces of sculpture, and a large octagonal marble font. The Campo-Santo, or ancient national cemetery, dates from the year 1228, when the Pisans caused earth to be brought from Jerusalem for the graves of the most distinguished citizens of the republic. In 1283, the ground was surrounded by cloisters, the walls of which were adorned by fresco-paintings, now nearly obliterated, although some of these works of art, which are chiefly by Giotto, Veneziano, Orcagni, and Memmi, still retain traces of their original beauty. Among the other public buildings of Pisa, special notice is due to the churches of La Madonna della Spina and San Stefano, both rich in paintings and sculptures, and the latter famous for its organ, the largest in Italy; the grand ducal and Lanfranchi palaces; the Torre della Fame, so called from its being supposed to have been supposed the spot in which Ugolino Gherardesca and his children were starved to death in 1288; the university, founded in 1330, and restored by Cosmo I. de' Medici, which enjoyed a high reputation in the middle ages, and still possesses claims to consideration in its library, botanical garden, observatory, and affiliated schools and art collections, etc. The population of Pisa, which, in the 13th c., amounted to 150,000, had fallen, in the present c., to less than one-sixth of that number; but of late years, trade and industrial arts have made a rapid advance, and the population has increased in proportion. In the neighborhood of Pisa, at the foot of San Giuliano, lie the mineral baths, whose fame was known to Pliny, and which continued through the middle ages to attract sufferers from every part of Italy. The waters, which are rich in carbonic acid and chloride of sodium, are found efficacious in various arthritic and rheumatic affections.

History.—Ancient Pisa, like other Etruscan cities subject to Rome, retained its municipal government, and enjoyed an almost unlimited freedom while nominally under Roman protection; but, on the decline of the imperial power, it was compelled to submit in turn to the various transalpine nations who successively overran northern Italy. Early in the 11th c., Pisa had risen to the rank of a powerful republic, whose sway included the then fertile district known as the Maremma di Lerici, and which yielded little more than nominal homage to its suzerain lords, the emperors of Germany. Throughout the 11th c. Pisa was at the height of its prosperity, and to this period belong most of the splendid monuments of art that still adorn the city. Its troops took part in all the great events of the Holy Land; and its fleet in turn gave aid to the pope in southern Italy, to the emperor in northern France, chastised the Moors, and exacted its own terms from the eastern emperors. In their wars with the Saracens of Sardinia, the Pisans had conquered Sardinia, Corsica, and the Balearic islands, and for a time maintained their ground against their hereditary enemies, the Genoese; but having sided with the Ghibellines in the long wars which desolated the empire, Pisa suffered severely at the hands of the victorious Guelphic party. Indeed, the rivalry of the Guelphic cities of Florence, Lucca, and Sienna nearly brought Pisa to the brink of ruin at the close of the 13th c.; and after struggling for more than a hundred years against external foes and the internal dissensions between the democratic mob and the Ghibelline nobles, without losing their character for indomitable valor, the Pisans finally threw themselves under the protection of Galeazzo Visconti of Milan. The son of the latter sold the Pisan territory to their greatest enemies, the Florentines, from whose tyrannical rule it was for a time relieved by Charles VIII. of France, who, in 1494, accepted the protectorate of the city. When the French left Italy, the old struggle was renewed; and after a desperate resistance, the Pisans, in 1509, were compelled by hunger to surrender to the Florentine army. The most influential families, as formerly in 1406, emigrated. Pisa, with the rest of Tuscany, became part of the kingdom of Italy in 1860. Since 1868 Pisa has given its name to an Italian province, containing a population of, '95, 309,915 (est.).

PISA, Council of, one of the councils commonly reputed by Roman Catholics as ecumenical or general, although some, especially of the ultramontane (q.v.) school do not look upon it as such. It was assembled in the time of the great western schism, for the purpose of restoring the peace of the church, and the unity which had been interrupted by the rival claims of two competitors for the papacy. The history of this rival claim will be found under the head Schism, Western. For our present purpose, it is enough to state that the adherents of both the claimants of the see of Rome—those of Gregory XII., as well as those of Benedict—agreed on the necessity of a general council, as the only means of putting an end to the schism; and the rival popes having themselves either evaded or declined the demand, the cardinals of both united in issuing letters of convocation, and in summoning both the claimants to the council so convened. Neither of them complied with the citation; but the council proceeded, nevertheless, to examine and deliberate upon the cause. It was opened at Pisa, Mar. 25, 1409, there being present 22 cardinals, 4 patriarchs, 12 archbishops, 80 bishops, together with representatives of 12 archbishops and 102 bishops, and a vast body of abbots, doctors in theology, and other eminent ecclesiastics. Of the proceedings, it will be enough to say, that after a formal citation of the rival popes to appear within a

stated period, the council, on the expiration of that period, proceeded to declare them contumacious, and to examine their respective claims as though they had appeared. The result, after a protracted inquiry, was a decree in the 13th session by which they were both declared schismatics, and their conduct heretical, and calculated to lead the people from the faith; wherefore, since they had violated the solemn engagements made at their respective elections, they were deposed from the papal dignity, and their followers released from obedience. In the 17th session, the cardinals having first pledged themselves by oath, each, that, if elected, he would continue the sittings of the council, entered into conclave to the number of 24, and unanimously elected Peter Philargi, one of the cardinal priests, and a member of the Franciscan order. He took the name of Alexander V. The council proceeded after his election to pass a number of decrees, for the purpose of giving validity to the acts done on either side during the schism. A vain attempt was made to obtain the submission of the still recusant rivals, and it was resolved that a new council should be held within three years. The authority of this council, like that of the council of Constance, is alleged, on the Gallican side, as establishing the superiority of a general council over the pope. But the ultramontanes reply that both these councils, and also that of Basel, must be regarded as abnormal assemblies, called to meet the special emergency of a disputed succession and of a doubtful pope, and that these principles cannot by any means be applied to the ordinary circumstances of the church, or form a precedent by which to estimate the normal relations between a pope whose title is certain and undisputed, and a general council regularly assembled at a time of peace, and in the ordinary circumstances of the church. It cannot be doubted, nevertheless, that the spirit of the fathers of Pisa was the same which ran through the succeeding assemblies of Constance and Basel, and found its permanent representation in the Gallicanism (see GALLICAN CHURCH) of later centuries

PISA'NO, ANDREA. See ANDREA PISANO.

PISANO, GIOVANNI, 1240–1320; b Italy; studied with his father Nicola. The fountain near the Perugia cathedral, the church of Santa Maria della Spina, and the Campo Santo at Pisa, and the Neapolitan Castel Nuovo, after which the Paris Bastille was modeled, are his work. He was engaged on the design of the Campo Santo, 1278–83. He imitated, or was associated with his father in some of his works. His finest sculptures are the mausoleums which he built for some of the popes, and the shrine for the high altar of the Arezzo cathedral. He is not to be confounded with Donatello's pupil of the same name.

PISANO, NICOLA, b. about 1206; studied the antique sculptures, and began the renaissance in Italian statuary. His finest sculptures are the pulpit for the cathedral of Siena, the pulpit in the baptistery of Pisa, and the marble urn of St. Dominic at Bologna. In architecture he designed the Frari church at Venice, the Santa Trinità at Florence, the basilica of St. Anthony at Padua, and the campanile for the church of San Nicola at Pisa. He d. 1278. See illus., SCULPTURE, Vol. XIII.

PISCATAQUA, a river about 80 m. in length, which forms the southern part of the boundary between the states of Maine and New Hampshire, and empties itself into the Atlantic, forming at its mouth the excellent harbor of Portsmouth.

PISCATAQUIS, a co. in n. Maine, intersected by the Bangor and Aroostook railroad, and drained by the Penobscot and Piscataquis rivers and their branches; 3772 sq. m.; pop. '90, 16,134. The northern portion is a vast forest; the southern portion contains fertile lands, and is extensively settled. The surface is generally hilly, and in some parts mountainous, abounding in lakes, the largest of which are Moosehead and Chesuncook. Mount Katahdin, 5,200 ft. high, stands near the center of the county, and is the highest point in the state. The principal products are grain, cattle, wool, cheese, and butter. It contains 22 saw-mills, manufactories of carriages, leather, harness, and woolen goods. Co. seat, Dover.

PISCICULTURE, or FISH-CULTURE, the breeding and rearing of fishes, in order to the increase of the supply for food. Hitherto it has been almost entirely limited to fresh-water fishes; nothing having been done as to sea-fishes but by legislation—chiefly in the case of the herring—to prevent the destruction of the very young fish, and that not, apparently, to much advantage. Ponds for sea-fishes have, indeed, been sometimes constructed, advantage being taken of natural circumstances favorable for the purpose. The ancient Romans had such ponds, and some have been made on different parts of the British coast, fishes being caught in the open sea and placed in them to be fed and fattened for the table. Such ponds, however, are of little real utility. That the Romans succeeded in keeping sea-fishes in fresh-water ponds, as has been asserted, must be regarded as mere fable, or as an exaggeration, founded on the power which a few fishes have of adapting themselves both to fresh and salt water. But it may be doubted if in modern times sufficient advantage has been taken of this power.

Ponds for fresh-water fishes have been common from a very remote antiquity. It appears from Isaiah, xix. 10, that they were used in ancient Egypt. In the times of Roman luxury almost every wealthy citizen had fish-ponds. The Chinese have long bestowed more attention on pisciculture than any other nation, and with them it is truly

a branch of economy, tending to the increase of the supply of food and of the national wealth; not merely, as it seems to have been among the Romans, an appliance of the luxury of the great. In some countries of modern Europe this branch of pisciculture is also prosecuted to a very considerable extent, particularly in Germany and Sweden, and of late years in France, in order to the supply of fish for the market. In Britain it has never been systematically prosecuted, or for any important purpose; the country-seats of the nobility and gentry being, indeed, generally provided with fish-ponds, but in most cases rather as ornamental waters than for use. In the northern parts of Britain trout, perch, and pike are almost the only fish kept in ponds; in England they are often stocked with carp and tench, and are turned to much better account than in Scotland. In Germany, ponds carefully attended to, are found very productive and remunerative. There can be no doubt that in Britain, also, many a piece of land at present very worthless, might easily be converted into a pond, and made to yield large quantities of excellent fish.

In the construction of ponds, or *stews*, for fish, it is recommended to have, if possible, a succession of three ponds on the same rivulet, with sluices, by which they can be dried, so that the fish may be easily taken when required, the different ponds being in part intended for fish of different ages. But all this must be very much regulated by local circumstances. It is of more importance to note that the margins should be shallow, so that there may be abundance of reeds and other water plants, and that only a small part of the pond should be too deep for the growth of pond-weeds (*potamogeton*). Much depends upon the soil of the neighborhood as to the supply of food, and consequently the growth of fish and productiveness of the pond. A stony bottom is very advantageous to perch and trout ponds; and in designing these, care should be taken to provide places of shelter for the fish, more especially if the pond be a shallow one, as trout and perch are easily killed by the glare of the sunshine. Ponds for pike must be larger than is necessary for any other fish known to British pisciculture; an extent of at least six acres is desirable. A nursery for minnows may be established with great advantage in connection with a fish-pond, as they afford most acceptable food to perch, pike, and trout. But in a pond where carp and tench are expected to spawn, the presence of minnows is very undesirable. It is often impossible to provide a pond with a place suitable for the spawning of trout, for which a gravelly stream with a quick current is necessary; but for perch, pike, carp, or tench, the pond itself is sufficient, and the stock, once introduced, is kept up without replenishing. Indeed, it is recommended that a pond stocked with carp should also be stocked with pike, that the excessive multiplication of the carp may be checked, which would otherwise prevent the fish from growing rapidly or to a good size. Private ponds and stews in which country gentlemen breed fish for the use of their own tables, as well as similar places attached to monasteries and other religious edifices, in which fish were grown for fast-day uses, were at one time common enough throughout Great Britain and Ireland. It is probable that some of our rarest fishes were introduced into this country during the old monastic times, such as the Lochleven trout, the vendace, etc.

The greatest improvement in pisciculture, and a most important branch of it, to which the term is often restricted, is the breeding of fish in artificial breeding places, from which not only ponds, but rivers, may be stocked; or the art of fecundating and hatching fish-eggs, and feeding and protecting the young animals till they are of an age to secure their own food and protect themselves from their numerous enemies.

Modern pisciculture is the revival of an old art well known to the ancient Italians, but which had fallen into abeyance for a number of centuries. The art of breeding and fattening fish was practiced by the luxurious Romans, and many stories are told about the fanciful flavors which were imparted to such pet fishes as were chosen for the sumptuous banquets of Lucullus, Sergius Orata, and others. The art had doubtless been borrowed from the ingenious Chinese, who are understood to have practiced the art of collecting fish-eggs and nursing young fish from a very early period. Fish forms to the Chinese a most important article of diet; and, from the extent of the water-territory of China, and the quantities that can be cultivated, it is very cheap. The plan adopted for procuring fish-eggs in China is to skim off the impregnated ova from the surface of the great rivers at the spawning-season, which are sold for the purpose of being hatched in canals, paddy-fields, etc.; and all that is necessary to insure a large growth of fish is simply to throw into the water a few yolks of eggs, by which means an incredible quantity of the young fry is saved from destruction, as a large percentage of the young of all fish die for want of food. Although all kinds of fish are enormously fecund, it is well known to naturalists that only a small percentage of the eggs ever come to life, and of the young fish, very few ever reach the table as food. So many of the eggs are destroyed by various influences, and so many likewise escape impregnation, that if we are to keep up our fish supplies, pisciculture, or protected breeding, becomes absolutely necessary.

Commercial pisciculture, as at present carried on, owes its origin to the French, the art having been first put in practice by M. Remy, a poor fisherman who gained a living by catching fish in the streams of La Bresse in the Vosges. This re-discovery of the lost art of fish-breeding is understood to have been quite accidental on the part of Remy, although it is thought by some zealous Scotsmen that the Frenchman must have heard of the experiments of Mr. Shaw of Drumlanrig, who, for a few years previous to

Remy's discovery, had been trying to solve some problems in the natural history of the salmon by means of the artificial system. The art had also been partially revived in Germany about the middle of last century by a gentleman of the name of Jacobi, who practiced the artificial breeding of trout. Whether or not Remy had heard of either of these experimenters, it is certain that to him we owe the revival of the art in its larger or commercial sense; the others only used it as an adjunct to their study of the natural history of fishes.

It was the great waste of eggs incidental to the natural system of fish-breeding that led Remy, about 1842, in conjunction with Gehin, a coadjutor whom he assumed as a partner, to try what he could do in the way of repeopling the fish-streams of his native district. His plan being at once successful, attracted the favorable notice of many of the French *savans*, and led to rewards and preferment for Remy; the new art was besides taken under the protection of the government. At Huningue, in Alsace, on the Rhine, a gigantic fish-nursery and egg-dépôt for the supply of eggs, and the dissemination of the art, was erected some years ago. Since the cession of Alsace to Germany, the operations of the establishment at Huningue (now known as Hüningen) have been conducted on a still larger scale by a German association.

The course of business at Huningue is as follows: The eggs are chiefly brought from the streams of Switzerland and Germany, and embrace those of the common trout, as well as the Rhine and Danube salmon, and the tender charr or ombre chevalier. People are appointed to capture gravid fish of these various kinds, and having done so, to communicate the fact to Huningue. An expert is at once sent to deprive these fishes of their spawn, and bring it to the breeding or resting-boxes, where it is carefully tended till it is ready to be dispatched to some district in want of it. It is, of course, much more convenient to send the eggs than the young fish, as the former, nicely packed among wet moss in little boxes, can be carried to a distance with greater facility. The mode of artificially spawning a salmon is as follows: It should, of course, be ascertained that the spawn is in a perfectly matured state, and that being the case, the salmon is held under water in a large tub, while the hand is gently passed along its abdomen, when, if the ova be ripe, the eggs will flow out like so many peas. The eggs are then carefully washed, and the water is poured off. The male salmon is then handled in a similar way, when the contact of the milt immediately changes the eggs into a brilliant pink color. After being again washed, they may be ladled out into the breeding-boxes, and left to come to life in due season. The period occupied in hatching is different in different climates. At Stormontfield, where the eggs have no shelter, the usual period is about 135 days; but salmon ova have been known to burst in about half that period, and to yield very healthy fish. Great care is of course necessary in handling the ova. The eggs manipulated at Huningue are all carefully examined on their arrival, when the bad ones are thrown out, and those that are good are counted and entered in a record. The ova are watched with great care, and from day to day all that become addled are removed. The applications for eggs, both from individuals and associations, are always a great deal more numerous than can be supplied; and before second applications can be entertained, it is necessary for the parties to give a detailed account of how their former efforts succeeded. It may be interesting to note, as regards the cost of pisciculture at Huningue, that the most expensive fish is the ombre chevalier. Of some species, as many as 60 or 70 per cent of the eggs are lost. The general calculation, however, is 12 living fish for a penny.

The most sustained effort in British pisciculture has been in connection with the salmon-fisheries of the river Tay. At Stormontfield, near Perth, a series of ponds has been constructed, and a range of breeding-boxes laid down capable of receiving 500,000 eggs. The operations at Stormontfield were begun in 1853, and are still continued. But for years a comparatively small number of fish have been hatched, and probably not 20,000 have for some time past been annually turned out of the ponds there. The annual rental is very high. At several other places in Scotland, the artificial system has been introduced as an adjunct to the natural breeding resources of different rivers. The art of pisciculture was also introduced into Ireland, at the fisheries of Loughs Mask and Carra, by the late Mr. Ashworth, who for a time obtained excellent practical results. These lochs contain an area of water equal to 35,000 acres; and, a communication with the sea having been opened, they now teem with salmon. Several attempts have been made to introduce British fishes into the rivers of Australia, which, in the case of trout, carp, tench, and perch, have been quite successful; but in that of salmon greater difficulty has been experienced. Sir James G. Maitland has erected an extensive fish-rearing establishment near Stirling, England. Each of the hatching boxes contains about 18,000 eggs, which, in addition to the tanks, give a product of 4,000,000 eggs each season. There are nine large ponds, and many smaller ones, each filled with a particular variety of fish.

Pisciculture is largely practiced in America, both by private persons and under the auspices of a commissioner, Mr. Spencer F. Baird, who acts on behalf of the government. Eggs are collected for distribution in the seas and rivers of the United States in enormous quantities, and are transported hither and thither to and from all parts of the country. As one example of what has thus been accomplished, it may be stated on the authority of a report made to the House of Representatives, that the number of eggs of the Californian salmon collected during the season of 1879 at the United States pisci-

cultural establishment on the M'Leod river, Cal., amounted to about 9,500,000, but the number for 1878 was 14,000,000. The California salmon adapts itself better than the common species to comparatively warm water. In Maine, there are hatching stations at Bucksport, for the Atlantic salmon (*salmo salmar*), and at Grand Lake stream, for the schoodic or land-locked salmon, a variety of the former. The aggregate yield of the shad hatcheries in 1879 was 16,000,000 young fish. The white fish (*Coregonus clupeiformis*) is reared in immense numbers in the Lake State hatcheries. See WHITEFISH. Three species of carp are propagated at Washington. The production of the 11 principal fish-breeding establishments in Canada in 1883 included 6,000,000 salmon eggs, 8,350,000 salmon-trout eggs, 43,000,000 white-fish eggs, and 20,000,000 eggs of members of the Percidæ family. See SALMON.

In recent years in parts of France, efforts have been made to increase the supply of oysters by means of artificial cultivation. Oysters were cultivated in Italy during the classic ages; but the art of cultivating them seems to have been lost till it was accidentally re-discovered by an artisan of the Ile de Ré, who found out that the chief point in artificial oyster-culture is to insure a supply of spat. The seed of the oyster is too often carried away from the place of its birth by adverse winds acting on the waves, and thus it sometimes falls on an unpropitious growing-place. The spat of the oyster must have a "coign of vantage" to which to cling; if it falls on a muddy bottom it is lost forever. On the foreshores of the Ile de Ré, there are countless oyster-beds of the most simple description, in which the spat is reared and tended during its period of growth. All that is required for a good bottom to an oyster-bed is a rocky surface, which, if not found naturally, can be easily constructed by the laying down of stones and tiles. Oyster-culture, in simple form, has been practiced at Whitstable, on the coast of Kent, for a long period, and the famous "native" oysters are fed on ground at that place.

Pisciculture is now being practiced to some extent in several countries of Europe, and has been deemed of sufficient importance to demand the attention of governments. It is probable that the attention turned to the whole subject of pisciculture, and the example of the transportation of salmon to Australia, may lead to the introduction of valuable kinds of fishes into waters where they are now unknown. The grayling has thus already been introduced into the Clyde and Tweed.

PISCINA, the large basin (or *pond*) in the Roman thermæ, containing tepid water, in which the bather might swim.

PISCINA, a shallow stone basin with a drain (usually leading directly to the earth), in Roman Catholic churches, in which the priest washes his hands, and for rinsing the chalice at the celebration of the mass. In England, it is almost invariably placed on the s. side of the choir, at a convenient height.

PISÉ, a kind of work used instead of brick, etc., for the walls of cottages. It consists of loam or earth hard rammed into framing, which, when dry, forms a wall.

PISE, CHARLES CONSTANTINE, D.D., 1802–66, b. Md.; graduated at Georgetown (D. C.) college, became a member of the society of Jesus, which he left two years later on the death of his father, who was an Italian. He studied in Rome, receiving the degree of D.D., and knighthood, and on his return taught rhetoric in the college of Emmetsburg. In 1825 he was ordained priest in the Roman Catholic church, and called to the cathedral of Baltimore; afterwards he ministered at St. Patrick's, Washington, and was chaplain of the senate; was assistant pastor of St. Peter's, New York; and in 1849 was appointed to St. Charles Borromeo, Brooklyn, where he remained till his death. He published *History of the Church,* 1827; *Father Rowland,* his finest work, 1829; *Aletheia, or Letters on the Truth of the Catholic Doctrines,* 1843; *St. Ignatius and his First Companions,* 1845; and *Christianity and the Church,* 1850.

PISEK (Boh. *Piscek,* sand), a small t. of Bohemia, on the right bank of the Wottawa, an affluent of the Moldau, stands on a sandy plain (from which circumstance it probably received its name) 55 m. s.w. of Prague. The town is old, and contains the remains of a royal castle. Among other institutions are a school of arts and a high school. The manufactures are woolen and cotton fabrics, iron wire, and musical instruments. Pop. '90, comm., 10,950.

PISGAH, a range of the mountains of Abarim, of which mount Nebo was the highest; or, as some suppose, the top of mount Nebo itself, from which Moses beheld the promised land, and where he died. It was in the land of Moab, at the n.e. angle of the Dead sea, near Jericho. The view obtained by Moses included "all the land of Gilead unto Dan; all Naphtali; the land of Ephraim, and Manasseh; all the land of Judah unto the utmost sea; the s., and the plain of the valley of Jericho—the city of palm-trees—unto Zoar." Tristam in *Land of Israel* beautifully describes the view which he and his party had, during a clear day, from a spot at, or near, which Moses probably stood. The elevation was about 4,500 ft., yet the ascent was not difficult.

PISID'IA, an ancient division of Asia Minor, bounded on the n. by Phrygia, on the e. and n.e. by Cilicia and Isauria, on the s. by Pamphylia, and on the s.w., and w. by Lycia and Phrygia. It belongs to the modern Turkish vilayet of Konieh. It was drained by the Catarrhactes, Cestus, and other streams emptying into the gulf of Pamphylia. The principal towns were Selge and Antiochia. The wines of Amblada were celebrated,

and salt and olives were chief productions. It was made a separate province by Constantine. Its inhabitants were mountaineers, and never submitted to the Romans.

PISIS'TRATUS (Gr. *Peisistratos*), a famous "tyrant" of Athens, belonged to a family of Attica, which claimed descent from Pylian Nestor, and was b. towards the close of the 7th c. B.C.—certainly not later than 605. His father's name was Hippocrates, and through his mother he was pretty closely related to the great lawgiver, Solon, between whom and Pisistratus a very intimate friendship long existed. He received an excellent education; and the charm of his manners, as well as the generosity of his spirit was so great that (according to Solon) had he not been ambitious, he would have been the best of Athenians; but his passion for the exercise of sovereign power led him to adopt a policy of artifice and dissimulation, for the purpose of attaining his ends, which prevents us from regarding him with the admiration that the beneficent character of his government might seem to demand. At first, Pisistratus co-operated with his kinsman Solon, and in the war against the Megarians, acquired considerable military distinction; but afterwards, when probably his ambitious views had become more matured, he came forward as the leader of one of the three parties into which Attica was then divided. These were, the *Pediæi* (party of the plain), or the landed proprietors; the *Parali* (party of the seaboard), or wealthy merchant classes; and the *Diacrii* (party of the Highlands), chiefly a laboring population, jealous of the rich, and eager for equality of political privileges. It was to the last of these that Pisistratus attached himself; but indeed he assiduously cultivated the good-will of all the poorer citizens, to whom he showed himself a most liberal benefactor. At last Pisistratus took a decided step. Driving into the market-place of Athens one day, and exhibiting certain self-inflicted wounds, he called upon the people to protect him against his and their enemies, alleging that he had been attacked on account of his patriotism. Solon, who was present, accused him of hypocrisy; but the crowd were, according to Plutarch, ready to take up arms for their favorite: and a general assembly of the citizens being summoned, Ariston, one of Pisistratus's partisans, proposed to allow him a body-guard of fifty men. The measure was carried in spite of the strenuous opposition of Solon. Gradually Pisistratus increased the number, and in 560 B.C., when he felt himself strong enough, seized the Acropolis. The citizens, in general, seem to have tacitly sanctioned this high-handed act. They were sick of the anarchic broils of the different factions, and probably glad to see their champion and favorite usurp supreme authority. Megacles and the Alcmæonids—the heads of the rich aristocratic party—immediately fled from the city. Solon, who loved neither oligarchic arrogance nor military despotism, but was a thorough constitutionalist, tried, but in vain, to rouse the Athenians against Pisistratus. Pisistratus, who was not at all vindictive in his disposition, did not attempt to molest Solon; he even maintained the legislation of the latter almost intact, and distinguished himself chiefly by the vigor of his administration. Pisistratus himself did not enjoy his first "tyranny" long. The *Pediæi* and the *Parali* rallied under Lycurgus and Megacles, united their forces, and overthrew the usurper, who was forced to go into exile. But the coalition of the two factions was soon broken up. Megacles hereupon made overtures to Pisistratus, inviting him to resume his tyranny, which he did; but a family quarrel with Megacles induced the latter again to ally himself with Lycurgus, and Pisistratus was driven from Attica. He retired to Eubœa, where he remained for ten years, ever keeping an eye, however, on Athens, and making preparations for a forcible return. How he managed to acquire so much influence while only a banished man is difficult to ascertain; but certain it is that many Greek cities, particularly Thebes and Argos, placed the greatest confidence in him, and finally supplied him abundantly with money and troops. Pisistratus at length sailed from Eubœa, landed in Attica at Marathon, and marched on the capital. His partisans hurried to swell his ranks. At Pallene he encountered his opponents, and completely defeated them, but used his victory with admirable moderation. When he entered the city no further resistance was made, and he resumed the sovereignty at once. The date of this event, as of most others in the life of Pisistratus, is very uncertain; perhaps we shall not err far if we place it about 543 B.C. He lived for sixteen years afterwards in undisturbed possession of power, dying 527 B.C., and transmitting his supremacy to his sons, Hippias and Hipparchus, known as the *Pisistratidæ*. His rule was mild and beneficent. Although the precautionary measures that he adopted to establish his authority involved at first a certain resolute and stringent policy (e.g., the seizure of the children of his leading opponents, and the detaining them as hostages); yet no sooner had he placed himself out of danger, than he began to display that wonderful tact, moderation, kindliness, and sympathetic appreciation of the wishes of the Athenians, that have won him the praise and esteem of all later ages, in spite of his usurpation. He firmly, but not harshly, enforced obedience to the laws of Solon; emptied the city of its poorest citizens, and made them agriculturists, supplying such as had no resources with cattle and seed; secured provision for old and disabled soldiers; bestowed great care on the celebration of the religious festivals of the Atticans, and even introduced some important changes; encouraged literature more than any Athenian had ever done before—it is to Pisistratus, or to the poets, scholars, and priests about him, that we owe, for example, the first complete edition of Homer (q.v.); and, like his still more brilliant successor in the following century, Pericles, he adorned Athens with many beautiful buildings, such as the Lyceum, a temple to the Pythian Apollo, another to Olympian Zeus, etc.

PI'SOLITE (Gr. pea-stone), a concretionary limestone, differing from oolite in the particles being as large as peas.

PISTACHE. See PISTACIA.

PISTA'CIA, a genus of trees of the natural order *anacardiaceæ*, having diœcious flowers without petals, and a dry drupe with a bony stone. The PISTACIA, or PISTACHIO TREE (*P. vera*), is a small tree of about 20 ft. high, a native of Persia and Syria, but now cultivated in all parts of the s. of Europe and n. of Africa, and in many places naturalized. It has pinnate leaves, with about two pair of ovate leaflets, and an odd one; flowers in racemes; fruit ovate, and about the size of an olive. The stone or nut splits into two valves when ripe; the kernel, which is of a bright green color, is very oleaginous, of a delicate flavor, and in its properties very much resembles the sweet almond. In the s. of Europe and in the east, *pistachio nuts* are much esteemed; but as they very readily become rancid, they are little exported to other countries. They are sometimes called *green almonds*. Oil is expressed from them for culinary and other uses. In cultivation one male tree is allowed to five or six fertile ones. See illus., TREES, ETC., vol. XIV., p. 540, fig. 6. The tree produces flowers and even fruit readily enough in the s. of England, but the summers are not warm enough to ripen the fruit.—THE MASTIC TREE, or LENTISK (*P. lentiscus*), yields the gum-resin called mastic (q.v.). It is a native of the countries around the Mediterranean.—The TURPENTINE TREE (*P. terebinthus*) yields the turpentine (q.v.) known in commerce as *Cyprus turpentine, Chian turpentine,* or *Scio turpentine,* which is of a consistency somewhat like that of honey, a greenish-yellow color, an agreeable odor, and a mild taste, and in its properties resembles the turpentine of the Coniferæ, but is free from acridity. It is obtained by making incisions in the trees, and placing stones for the turpentine to flow upon, from which it is scraped in the morning, before it is liquified again by the heat of the sun. The tree is about 30 or 35 ft. in height, and has pinnate leaves, of about three pair of leaflets and an odd one; the flowers in compound racemes, the fruit nearly globular. The kernel of the fruit is oleaginous and pleasant.—The BATOUM TREE (*P. Atlantica*), a round-headed tree of about 40 ft. in height, a native of the n. of Africa, produces a fruit much used by the Arabs; and a gum-resin of pleasant aromatic smell and agreeable taste, which exudes from its stem and branches, is chewed to clean the teeth and impart a pleasant smell to the breath.—The fragrant oil of the kernels of *P. oleosa*, a native of Cochin China, is used by the people of that country to impart a perfume to ointments.

PIS'TIL, in botany, the female organ of fructification in phanerogamous plants; that part of the flower (q.v.) which, after flowering is over, is developed into the fruit. There is sometimes one pistil in a flower, sometimes more; in some flowers, which have numerous pistils, they form a number of whorls, one within another, sometimes on an elevated receptacle or elongated axis, or more rarely, they are spirally arranged. In every case the center of the flower is occupied by the pistil or pistils, if present. See FLOWER. A pistil is either formed of a single carpel (q.v.), as is the case when there are numerous pistils, or of several carpels combined; and the number of carpels of which the pistil is formed is often indicated by the number of the cells of the germen, or by its lobes or angles. The pistil usually consists of a germen (q.v.) or ovary, in which the ovules (q.v.) are contained, and which is surmounted by a *stigma*, either immediately or through the intervention of a *style*; but in gymnogens (q.v.) there is neither germen, style, nor stigma, the female organs of fructification being mere naked ovules. The germen is always the lowest part of the pistil. The stigma exhibits an endless variety of forms, and is adapted to the reception and retention of the pollen grains requisite for fecundation, partly by the roughness of its surface—which is of a somewhat lax cellular tissue, covered with pro-

PISTILS:

1, Section of flower of a species of primrose, showing the pistil laid open; numerous ovules attached to a free central placenta. 2, Section of flower of comfrey, with corolla removed, showing two of the four ovaries, and the style. 3, Pistil of the barberry, consisting of several carpels combined; the style very short and thick, the stigma shield-like. 4, Section of the ovary of a lily. 5, Section of flower of cherry, showing pistil of two separate carpels, only one of which comes to perfection in fruit. 6, Pistil of pea, opened; *a*, ovule; *b*, placenta; *f*, umbilical cord.—From Balfour's *Class-Book of Botany*; also see illus., BOTANY, vol. II., p. 800, fig. 8.

jecting cells, often in the form of minute warts, and often elongated into hairs—and partly by the secretion of a viscous fluid. The stigma, when not *sessile*—or seated immediately on the germen—is supported by the style, which rises from the germen, and on the top of which the stigma is generally placed. The style is sometimes very long and slender, sometimes very short; the germen sometimes passes imperceptibly into the style, and sometimes the style rises from it abruptly; and similar differences appear in the relations of the style and stigma; the stigma, however, may be regarded as always an expansion of the top of the style, although it is sometimes, but rarely, situated on one or both sides of the style, beneath its summit. In like manner, by peculiar modifications taking place in the growth of the germen, the style sometimes seems to rise from beneath its apex, or even from its base; but it always rises from what is, structurally considered, the real apex of the germen. When several carpels are united to form one germen, they are sometimes again separated in their styles, and more frequently in their stigmas, so that one germen bears several styles, or the style divides at some point above the germen, or one style is crowned by a number of stigmas. The style is usually cylindrical; and when this is not the case it is often owing to the combination of several styles into one, although sometimes the style is flat and even petal-like. It is traversed throughout its whole length by a canal; which, however, is in general filled up by cells projecting from its sides, and often also by very slender tubes extending in the direction of its length; the function of the canal, to which in some way or other the inclosed slender tubes are subservient, being to bring about the connection between the pollen and the ovules for fecundation (q.v.). The length of the style is adapted to the ready fecundation of the ovules, being such that the pollen may most easily reach the stigma; and in erect flowers the styles are usually shorter than the stamens; in drooping flowers they are longer than the stamens. After flowering is over, when fecundation has taken place, the *foramen* of the ovules closes, the germen enlarges and ripens into the fruit, whilst each ovule is developed into a seed. The style and stigma meanwhile either fall off, or remain and dry up, or they increase in size, and are changed into various kinds of appendages of the fruit, as feathery awns, beaks, etc.

PISTILLID'IUM, in botany, a term which, along with *antheridium* (q.v.), must be regarded as provisional, and as expressive of an opinion, probable, but not yet ascertained to be true. The evidence in favor of it, however, seems continually to increase, and its great probability is more and more generally acknowledged. The pistillidium is an organ of cryptogamous plants, supposed to perform functions in fructification analogous to those of the pistil in phanerogamous plants. It consists of a germen-like body—the *sporangium*, *theca*, or *spore-case*—hollow, and containing spores (q.v.), by which the species is propagated. These spore-cases are very various in their forms, and in the situations which they occupy in different orders and genera; being sometimes immersed in the substance of the plant, sometimes distinct from it, sometimes sessile, sometimes stalked, etc. See the articles on the different cryptogamous orders.

PISTO'JA (anc. *Pistorium*), a manufacturing t. of Italy, in the province of Florence, and 20 m. by railway n.w. of the city of that name, stands on a gentle rising ground at the foot of the Apennines. It is well built; its streets are thoroughly Tuscan, and it is surrounded by lofty and well-preserved walls. The chief buildings are the cathedral, built at various times, and containing a number of good pictures; several old and interesting palaces, and a number of churches, some of which are of importance in the history of mediæval architecture and sculpture. The principal manufactures are iron and steel wares, and paper. Pop. abt. 20,200.

PISTOL is the smallest description of fire-arm, and is intended to be used with one hand only. Pistols vary in size from the delicate saloon-pistol, often not six in. long, to the horse-pistol, which may measure eighteen in., and sometimes even two feet. They are carried in holsters at the saddle-bow, in the belt, or in the pocket. Every cavalry soldier should have pistols, for a fire-arm is often of great service for personal defense, and almost indispensable in giving an alarm or signal. Sailors, when boarding an enemy's ship, carry each two in their waist-belts. As early as the reign of Henry VIII. the English cavalry carried clumsy pistols called "dags." The latest improvement on the pistol is the revolver (q.v.).

PISTO'LE, the name formerly given to certain gold coins current in Spain, Italy, and several parts of Germany. The pistole was first used in Spain, and was originally equivalent to about 11 old French livres, but till 1728 it was merely an irregular piece of gold. From this time till 1772 its value was about $4.25. But it was after this date decreased till it reached the value of 80 reals, or about $4.00. The Italian pistoles were also gold coins, and varied considerably in value; that of Rome = $3.37; of Venice = $4.05; of Florence and Parma = $4.20; and the old coin of Piedmont = abt. $5.35, or 24 old liras. Gold coins of this name used to be current in Hesse-Cassel, Switzerland, Brunswick, and Hamburg, but were in most cases merely convenient multiples of the ordinary thaler and gulden. Of late years, and especially since the introduction of new systems of coinage in Spain and Italy, and of a uniform system in the German empire, the name pistole is scarcely ever used.

PI'SUM. See PEA.

PIT, in gardening, is an excavation in the ground, intended to be covered by a frame (q.v.), and to afford protection to tender plants in winter, or for the forcing of vegetables, fruits, etc. Pits are often walled on all sides, although, in many cottage gardens, excellent use is made of pits which are mere excavations. The walls are often raised above the ground, particularly the back wall, the more readily to give slope to the glazed frame. A pit in which no artificial heat is supplied is called a *cold pit;* but when forcing is intended, flued pits are often used. Artificial heat is sometimes also given by means of fermenting matter. The ventilation of pits, as much as the weather will permit, is of the greatest importance.

PITA-HEMP, one of the names of the agave or aloe fiber. See AGAVE.

PIT'AKA (literally "basket") is, with the Buddhists, a term denoting a division of their sacred literature, and occurs especially in combination with *tri*, "three;" *tripit'aka*, meaning the three great divisions of their canonical works, the *vinaya* (discipline), *abhidharma* (metaphysics), and *sútra* (aphorisms in prose), and collectively, therefore, the whole Buddhistic code. The term "basket" was applied to these divisions, because the palm-leaves on which these works were written were kept in baskets, which thus became a part of the professional utensils of a bhikshu, or religious mendicant.

PITAVAL, FRANÇOIS GAYOT DE, 1673–1743 ; b. France ; entered the army, but afterward studied jurisprudence, and became an advocate at Paris. His chief work is the compilation called *Causes Célèbres et Interessantes* (20 vols., 1734–43).

PITCAIRN, JOHN, d. 1775 ; b. Scotland ; the only British officer who was accounted fair in his dealings with the people of Boston in their altercations with the British soldiers. He was commissioned capt. of marines, 1765; major, 1771. He was prominent in the battle of Lexington, conducting the expedition to that town, April 19, 1775, and commenced the attack on the militia collected there; but he denied that he ordered the first shot to be fired. He was shot at the battle of Bunker Hill when about to enter the redoubt. His son David, a distinguished physician in London, died 1809.

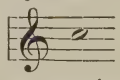
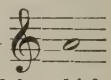
PITCAIRN ISLAND, a solitary island in the Pacific ocean, lying at the south-eastern corner of the great Polynesian archipelago, in lat. 25° 3′ 6″ s., and long. 130° 18′ west. Its length (2¼ m.) is about twice its breadth, and the total content is approximately 3 sq.m.; so that, except from its being the only station (with the exception of the Gambier islands) between the South American coast and Otaheite at which fresh water can be procured, it would be too insignificant to deserve notice, were it not for the manner in which it was colonized. The island is wholly surrounded by rocks; it has no harbor, and its soil is not very fertile. It was occupied in 1790 by the mutineers of the *Bounty* (see BLIGH, WILLIAM), who after touching at Toobouai sailed for Tahiti, where they remained for some time. Christian, the leader of the mutineers, however, fearing pursuit, hastened their departure; and after leaving a number of their comrades who preferred to stay on the island, they brought off with them 18 natives and sailed eastward, reaching Pitcairn Island, where they took up their residence and burned the *Bounty.* They numbered then 9 British sailors—for 16 of the sailors had preferred to remain at Tahiti, and of these 14 were subsequently captured, and (Sept., 1792) three of them executed—and 6 Tahitian men, with 12 women. It was impossible for concord to subsist in a band of such desperate character; and in the course of the next ten years all the Tahitian men, all the sailors, with the exception of Alexander Smith (who subsequently changed his name to John Adams), and several of the women, had died by violence or disease. From the time of their leaving Tahiti nothing had been heard of them, and their fate was only known when an American, Capt. Folger, touched at Pitcairn Island in 1808, and on his return reported his discovery to the British government; but no steps appear to have been taken by the latter. On Sept. 17, 1814, a British vessel, the *Britain,* called at the island and found old Adams still alive, commanding the respect and admiration of the whole little colony by his exemplary conduct and fatherly care of them. Solitude had wrought a powerful change in Adams; and his endeavors to instill into the young minds of his old companions' descendants a correct sense of religion had been crowned with complete success, for a more virtuous, amiable, and religious community than these islanders had never been seen. They were visited by British vessels in 1825 and 1830, and the reports transmitted concerning them were fully corroborative of the previous accounts; but in 1831 their numbers (87) had become too great for the island, and at their own request they were transported to Tahiti in the *Lucy Ann* by the British government. But, disgusted at the immorality of their Tahitian friends and relatives, they chartered a vessel, defraying the cost of it in great part with the copper bolts of the *Bounty,* and most of them returned to Pitcairn island at the end of nine months. In 1839, being visited by Capt. Elliot of H.M.S. *Fly,* they besought to be taken under the protection of Britain, on account of the annoyances to which they had been subjected by the lawless crews of some whale-ships which had called at the island; and, accordingly, Capt. Elliot took possession of it in the name of her majesty, gave them a union jack, and recognized their self-elected magistrate as the responsible governor. He also drew up for them a code of laws, some of which are amusing from the subjects of which they treat, but the code was of great use to the simple islanders. From this time they were frequently visited by European ships; and in 1855, finding their numbers again too

great for the island, they petitioned government to grant them the much more productive Norfolk island, to which they were accordingly removed in 1856. In 1859, however, two families, numbering in all 17, returned to Pitcairn Island, reducing the number on Norfolk Island to 202, and others have since followed. From their frequent intercourse with Europeans, the Pitcairn islanders have, while still retaining their virtuous simplicity of character and cheerful, hospitable disposition, acquired the manners and polish of civilized life, with its education and taste. They are passionately fond of music and dancing, the latter evidently a legacy from their maternal ancestry. The men are engaged in whaling and herding cattle, or in cultivating their gardens and plantations; while the women (who seem to be the more industrious class) attend to their families, manage the dairies, and take an occasional part in field-labor.

Pitcairn Island was first discovered by Carteret in 1767, and was named by him after one of his officers; but it was never visited by Europeans till taken possession of by the mutineers. When Admiral de Horsey visited Pitcairn island in 1877, there were in all 16 men, 19 women, 25 boys, and 30 girls on the island. See the account published by him in 1878. Pop. '90, 120.

PITCH. The common kind of pitch is the black residue which remains after distilling wood-tar. See TAR. It is made extensively in Russia, Norway, and North America. It is a most useful material for protecting wood from the action of water, hence it is used for calking the seams and coating the outsides of ships and boats; it is also applied to the inside of water-casks, and many similar uses. A variety of pitch is now obtained from the distillation of coal-tar, and another from bone-tar; the latter is said to be nearly equal in value to that from wood, but coal-pitch wants the toughness which is one of the more valuable qualities of wood-pitch. It is, however, much used in making artificial asphalt for building and paving purposes, and for the black varnish used for coating iron-work to keep it from rusting. Pitch is solid at the ordinary temperature of our climate, but softens and melts with a small accession of heat.

PITCH, the degree of acuteness of musical sounds. A musical sound is produced by a series of vibrations recurring on the ear at precisely equal intervals; the greater the number of vibrations in a given time, the more acute or higher is the pitch. In stringed instruments the pitch is dependent on the length, the thickness, and the degree of tension of the strings; the shorter and thinner a string is, and the greater its tension, the higher is the pitch of the note. In wind instruments, where the notes are produced by the vibration of a column of air, as in the mouth-pipes of an organ, the pitch is dependent on the length of the column set in motion; the shorter the column of air, the higher the pitch becomes.

The pitch of musical instruments is adjusted by means of a tuning-fork, consisting of two prongs springing out of a handle, so adjusted as to length that when struck a particular note is produced, that note being C  in Britain, and A  in Germany. It is obviously important to have a recognized standard of pitch by which instruments and voices are to be regulated; but there is, unfortunately, not the uniformity that might be desired in the pitch in actual use. For a long time prior to 1859 concert-pitch had been gradually rising, to the detriment of the voices of public singers. The C tuning-fork, in use in 1699, made 489 vibrations per second, while in 1859 the number of vibrations had increased to 538. Mr. Hullah, in 1842, in the numerous classes instituted by him under the sanction of the committee of council on education, found it necessary to secure a uniform standard of pitch, and adopted 512, which has an especial convenience as being a power of 2. The French imperial government, in 1858, fixed on 522. In 1859 a committee of the society of arts was appointed to consider the subject of a uniform musical pitch. Their deliberations lasted 12 months. Sir John Herschel, in a letter to the committee, strongly recommended the number 512. It was agreed on all hands that the then existing opera-pitch of 546 was too high and painful to the singers of soprano music. The instrumental performers stated that they could lower the pitch to 528, but if they had to lower it to 512 some of them would have to purchase new instruments; and, in consequence apparently of their representation, the committee reported in favor of 528.

PITCHBLENDE, a mineral which is essentially oxide of uranium (q.v.), with slight mixtures of other substances. Its color is grayish-black or brownish-black. It is infusible before the blow-pipe without the addition of borax, with which it fuses into a dull yellow glass.

PITCHER, THOMAS GAMBLE, b. Ind., 1824; graduated at West Point, and was appointed to the infantry in 1845. He served through the Mexican war, and was promoted capt. in 1858. He was made brig.-gen. of volunteers in 1862, and was afterwards assistant provost-marshal-gen. He was appointed col. of the 44th infantry in 1866, was supt. of West Point, 1866–71; governor of Soldiers' home, Washington, 1871–77; retired, 1878; and superintendent New York soldiers' and sailors' home, 1880–87. He d. in 1895.

PITCHER PLANT. See NEPENTHES.

PITCHSTONE, a name sometimes given to a variety of common opal (q.v.), brown, black, gray, red, or of mixed colors; the luster more resinous than in opal, and the fracture less perfectly conchoidal. It occurs in several localities in the British islands, in Saxony, etc.—The same name is given to another mineral (Ger. *pechstein*), a variety of felspar (q.v.), occurring as a rock in dikes which traverse strata or in overlying masses; compact, slaty, or in concentric slaty concretions. It exhibits great variety of color, and has a somewhat resinous appearance. It often contains numerous imbedded crystals of felspar, and is then called *P. porphyry.*

PITCHURIM BEANS, or Sassafras Nuts, an occasional article of importation from South America, are the seed-lobes of *nectandra puchury,* a tree of the same genus with the greenheart (q.v.), growing on the banks of the Rio Negro and elsewhere in the rich alluvial parts of the basin of the Amazon. They are about 1½ in. long, and half an inch broad. They are much in request among chocolate manufacturers for flavoring chocolate, as a substitute for vanilla. They are sometimes called wild nutmegs, because of a resemblance to nutmeg in flavor. The name sassafras nuts is also due to the flavor, which approaches that of sassafras bark; and the tree belongs to the same natural order with the sassafras tree.

PIT DWELLERS of Yezo: the aboriginal inhabitants of the island of Yezo, Japan, who have left indications of their presence in the form of pit-like depressions of a rectangular shape, around which flint arrows and fragments of earthenware are found. According to Japanese authorities, they were a race of dwarfs, and lived in huts built over these pits. They were driven out by the Ainos, who in their turn yielded at the advent of the Japanese. Their presumed descendants, or at least a race of people who dwell in huts built over similar holes, are now found in portions of the Kurile islands, and, more rarely, in Saghalin and Kamchatka.

PITEA, or North Bothnia. See Norrbotten.

PITH, *Medulla,* the light cellular substance which occupies the center of the stem and branches in exogenous plants (q.v.). In the earliest stage of a young stem or branch, it is entirely composed of pith and bark, by which alone, therefore, young buds are nourished; the vascular bundles or woody fiber appearing afterwards, and, in trees and shrubs, generally increasing, so as to constitute the greater part of the substance of the stem and branches, whilst the pith is ultimately reduced to a very small column in the center. The pith, however, exists even in the most mature woody stem, and maintains its connection with the bark by means of *medullary rays,* analogous in their character to the pith itself, and which exist even in the most compact wood, although much compressed by the woody layers, and in a transverse section appearing as mere lines. The medullary rays convey to the central parts of the stem the secretions of the bark necessary for their nourishment. Pith is in general entirely composed of cellular tissue; vessels occurring in it only in a few plants. Its cells diminish in size from the center towards the circumference. In a few plants it exhibits cavities which have a regular arrangement; in many herbaceous plants of rank growth large irregular cavities occur in it. The pith is immediately surrounded by a thin vascular layer called the *medullary sheath,* consisting chiefly of spiral vessels, which continue to exercise their functions during the life of the plant.

PITHECIA. See Saki.

PITHECUS. See Orang.

PITHOM. See Succoth.

PITKIN, a w. central co. of Col., formed 1881; 950 sq.m.; pop. '90, 8929. It is drained by several creeks, affluents of the Grand river, and contains the lofty Elk range of mountains. Co. seat, Aspen.

PITKIN, Timothy, ll.d., 1766–1847, b. Conn.; educated at Yale college, and admitted to the bar. He was for 5 years speaker of the lower house of the state legislature, and a member of congress, 1806–20. He wrote *A Statistical View of the Commerce of the United States* (1816); and *Political and Civil History of the United States from* 1763 *to the Close of Washington's Administration,* 2 vols. 1828.

PITMAN, Sir Isaac, b. England, 1813; educated at the Normal college of the British and foreign school society of London; in 1832 began to teach school at Barton-on-Humber, and was afterwards master of several other schools. He was the inventor of the system of phonetic writing, or shorthand. His first work on the subject was printed in 1887, *Stenographic Sound-hand.* He afterward devoted himself entirely to teaching his system, publishing many manuals and treatises, acting as editor of the *Phonetic Journal,* a weekly paper, and printing in shorthand character a number of books, including the Bible. For many years he was greatly interested in the subject of a reform in English spelling, and issued a number of pamphlets advocating radical measures. For a description of his system see Shorthand. The phonetic society was organized by Pitman in 1843. In 1894 he was knighted by the Queen. He died in 1897.

PITON BARK. See Caribbee Bark.

PITRI' (a Sanskrit work literally meaning father = Latin *pater,* in the plural *pitaras,* but in English translations from the Sanskrit usually Anglicized to *pitris*), a name which, in a general sense, means the deceased ancestors of a man, but in the special sense in

which it occurs in Hindu mythology, denotes an order of divine beings inhabiting celestial regions of their own, and receiving into their society the spirits of those mortals for whom the funeral rites (see SRÂDDHA) have been duly performed. They include, therefore, collectively the manes of the deceased ancestors; but the principal members of this order are beings of a different nature and origin. According to Manu, they were the sons of Marîchi, Atri Angiras, and the other rishis or saints produced by Manu, the son of Brahmâ; and from them issued the gods, demons, and men. According to several Purânas (q.v.), however, the first pitris were the sons of the gods; and to reconcile this discrepancy, a legend relates that the gods having offended Brahmâ by neglecting to worship him, were cursed by him to become fools; but, upon their repentance, he directed them to apply to their sons for instruction. Being taught accordingly the rites of expiation and penance by their sons, they addressed the latter as fathers, whence the sons of the gods were the first pitris (fathers). See Wilson's *Vishnu-Purâna.* Manu enumerates various classes of pitris, in defining those who were the ancestors of the gods, those who were the ancestors of the demons, and those from whom proceeded the four castes severally; but he adds, at the same time, that these are merely the principal classes, as their sons and grandsons indefinitely must likewise be considered as pitris. The Purânas divide them generally into seven classes, three of which are without form, or composed of intellectual, not elementary substance, and assuming what forms they please, while the four other classes are corporeal. In the enumeration, however, of these classes the Purânas differ. The pitris reside in a world of their own, called Pitriloka, which is sometimes supposed to be the moon; according to the Purânas, it is below the paradise of Indra, and is also the abode of the souls of devout Brahmans. The time at which the pitris are to be worshiped, the libations which they are to receive, the benefit which they derive from them, and the boons which they confer on the worshiper, are all minutely described in the Purânas. See SRÂDDHA. A song of the pitris, as given by the *Vishnu-Purâna,* may convey an idea of the importance attributed to this worship, and of the manner in which the Brahmans turn it to their profit. It runs as follows: "That enlightened individual who begrudges not his wealth, but presents us with cakes, shall be born in a distinguished family. Prosperous and affluent shall that man ever be who, in honor of us, gives to the Brahmans, if he is wealthy, jewels, clothes, lands, conveyances, wealth, or any valuable presents; or who, with faith and humility, entertains them with food, according to his means, at proper seasons. If he cannot afford to give them dressed food, he must, in proportion to his ability, present them with unboiled grain, or such gifts, however trifling, as he can bestow. Should he be utterly unable even to do this, he must give to some eminent Brahman, bowing at the same time before him, sesamum seeds adhering to the tips of his fingers, and sprinkle water to us, from the palms of his hands, upon the ground; or he must gather, as he may, fodder for a day, and give it to a cow; by which he will, if firm in faith, yield us satisfaction. If nothing of this kind is practicable, he must go to a forest, and lift up his arms to the sun and other regents of the spheres, and say aloud, 'I have no money, nor property, nor grain, nor anything whatever fit for an ancestral offering; bowing therefore to my ancestors, I hope the progenitors will be satisfied with these arms tossed up in the air in devotion.'" See Wilson's *Vishnu-Purâna.*

PITT, a co. in e. North Carolina, drained by the Tar river, Grindle creek, and the Neuse river; 658 sq.m.; pop. '90, 25,519. The surface is level, and well wooded, and the soil fertile. The principal productions are corn, potatoes, and cotton. Co. seat, Greenville.

PITT, WILLIAM, the second son of the earl of Chatham and of lady Hester Grenville, daughter of the countess Temple, was born on May 28, 1759. His genius and ambition displayed themselves with an almost unexampled precocity. "The fineness of William's mind," his mother writes of him, when he was but twelve years old, "makes him enjoy with the greatest pleasure what would be above the reach of any other creature of his small age." Owing to the excessive delicacy of his constitution, it was found impossible to educate him at a public school. His studies were, however, prosecuted at home with vigor and success. In 1773 he was sent to the university of Cambridge, where his knowledge of the classics seems to have astonished veteran critics. To modern literature he appears to have been utterly indifferent—he knew no continental language except French, and that very imperfectly. Among English poets, he liked Milton best; the debate in pandemonium being his favorite passage. In 1780 Pitt was called to the bar. He took chambers in Lincoln's Inn, and joined the western circuit. A general election having taken place in the autumn of the same year, he stood for the university of Cambridge; but he was at the bottom of the poll. Through the influence, however, of the duke of Rutland, he obtained a seat in parliament as member for Appleby, Lord North was now prime-minister. The opposition consisted of two parties; one being led by Rockingham and Fox, the other by lord Shelburne. The latter consisted chiefly of the old followers of Chatham; and to this party Pitt naturally became attached. On Feb. 26, 1781, he made his first speech in parliament. It was in favor of Burke's plan of economical reform, and was a splendid success. "It is not a chip of the old block," said Burke, "it is the old block himself." Shortly before the meeting of parliament, in the autumn of 1781, the news arrived of the surrender of Cornwallis and his army. In the

debate on the address, Pitt spoke with even more energy and brilliancy than on any former occasion. No one was so loud in eulogy as Henry Dundas, lord advocate of Scotland; and from this night dates a connection between him and Pitt, which was only broken by death. After several defeats, the ministry resigned, and Rockingham was called on to construct a cabinet. Pitt was offered the vice-treasurership of Ireland; but he declined to accept a position which did not confer a seat in the cabinet. On May 7, 1782, he made his first motion for a reform in the representation of the people; which motion was lost by only 20 votes in a house of more than 300 members. The reformers never again had so good a division till 1831. At the end of three months after his accession to office, Rockingham died; lord Shelburne succeeded to the head of the treasury; and Pitt, at the age of 23, became chancellor of the exchequer. In opposition to the government, there was then formed a coalition emphatically known as "the coalition." On lord Shelburne's resignation in 1783, the king himself, who hated the coalition, tried to persuade Pitt to take the helm of affairs; but he resolutely declined. The duke of Portland succeeded, with Fox and North as secretaries of state. Pitt from the opposition benches, brought for a second time the question of parliamentary reform before the house. His motion was lost by 293 votes to 149. On the prorogation, he visited the continent for the first and last time. In 1783, the ministry having been defeated on a motion for transferring the government of India to parliament, Pitt became first lord of the treasury and chancellor of the exchequer. But parliament was dead against him: between Dec. 17, 1783, and March 8, 1784, he was beaten in sixteen divisions. The nation, however, was in his favor; both on account of his policy, and from admiration of his private character. Pecuniary disinterestedness is what all can comprehend; and even when known to be overwhelmed with debt, when millions were passing through his hands, when the greatest men in the land were soliciting him for honors, no one ever dared to accuse him of touching unlawful gain. At the general election in 1784, 160 supporters of the coalition lost their seats, Pitt himself heading the poll for the university of Cambridge. He was now, at 25 years old, the most powerful subject that England had seen for many generations. He ruled absolutely over the cabinet, and was at once the favorite of the sovereign, of the parliament, and of the nation; and from this date, the life of Pitt becomes the history of England and of the world. For seventeen eventful years he held his great position without a break. In 1784 he established a new constitution for the East India company. In 1786 he carried through a commercial treaty with France on liberal principles. In the same year he established a new sinking fund; a scheme which experience has shown to be wrong in principle, though it was long viewed with favor by the nation. To exertions which were now begun for the abolition of the slave-trade, he gave the help of his eloquence and power. In 1788–89 he maintained against Fox the right of parliament to supply the temporary defect of royal authority occasioned by the incapacity of the king. The year 1793 saw the beginning of the great war with France. Authorities differ as to the cause. It is, however, certain that Pitt's military administration was eminently unsuccessful. But no disaster could daunt his spirit. When a new French victory, a rebellion in Ireland, a mutiny in the fleet, and a panic in the city had spread dismay through the nation, Pitt from his place in parliament poured forth the language of inextinguishable hope and inflexible resolution. Disaster abroad was regularly followed by triumph at home, until at last he had no longer an opposition to encounter. In 1799 he effected the union with Ireland. It was part of his scheme to relieve the Roman Catholic laity from civil disabilities, and to grant a public maintenance to their clergy; but the obstinacy of the king frustrated this design. Chagrined by this failure, Pitt resigned office in 1801. He was succeeded by Mr. Addington, to whom for a while he gave his support. In 1804 he returned again to the head of the treasury, which position he continued to hold till his death on Jan. 23, 1806. This event was doubtless hastened by the stupendous success of Napoleon. The peculiar look which he wore during the last ten days of his life was pathetically termed by Wilberforce "the Austerlitz look." The impeachment also of his friend lord Melville is supposed greatly to have hastened his end. It gave him, he said in parliament, a deep pang. His voice quivered as he uttered the word; and it seemed as if the man of iron were about to shed tears. "He was," says Macaulay, "a minister of great talents; honest intentions, and liberal opinions, ... but unequal to surprising and terrible emergencies, and liable in such emergencies to err grievously, both on the side of weakness and on the side of violence." But what man ever lived, we may ask, who, placed in such circumstances as Pitt, would not often have greatly erred? His policy was liberal beyond his age, at least he wished it to be so, although he was often obliged to yield to the prejudices of his sovereign. He resigned office because he could not carry Catholic emancipation. He laid before the king unanswerable reasons for abolishing the test act. He was more deeply imbued with the doctrines of free-trade than either Fox or Grey. It cannot indeed be denied that he was addicted to port-wine, and that he died overwhelmed with debts; parliament voting £40,000 to his creditors. High as his character stands, it would have stood even higher had he united the virtue of frugality to that of disinterestedness. See *Life of Pitt*, by lord Stanhope (Lond. 1861); also lord Macaulay's *Biographies* (Edin. 1860). In the former work, vol. ii., p. 185, will be found a valuable criticism on Macaulay's memoir.

PITT, William, Earl of Chatham. See Chatham, Earl of.

PITTA (from the Telegu *pitta*, a small bird), Vieillot's name for a genus, and now extended to a group, of passerine birds, known as *brêves* by the French. The characteristics are brilliant plumage, with sharply-marked contrasts of color, a very short tail, long legs, with scutellated tarsi, and, generally, a strong bill. The *pittidæ* were long supposed to be allied to the *turdidæ*, or thrushes, but in 1876 Garrod separated them positively, discovering that, as in the *tyrannidæ*, the muscles of the syrinx are attached to the middle of its half rings, and not to their extremities, as in the higher passerines. Nearly 50 species have been described, inhabiting the Malay archipelago, China, India, Australia, and Angola. Their habits are terrestrial chiefly; in some instances the sexes closely resemble each other, in color. *P. gigas* (Surinam) is nearly as large as a rook.

PIT'TACUS, 651–569 B.C.; b. Mitylene, Lesbos; son of a Thracian, and one of the "seven wise men of Greece." About 611 he aided in overthrowing Melanchrus, tyrant of Lesbos; headed his townsmen in a war with the Athenians for possession of Sigeum in the Troad, and though unsuccessful, slew the Athenian leader, devoting the land in Mitylene given him as a reward, to sacred uses, whence it was long known as the "Pittacian land." On the banishment of Alcæus the poet, and his aristocratic party, about 589, P. was chosen dictator (æsymnetes), resigning in 579. To him are ascribed the sayings, "It is a misfortune to be eminent," and "Know your opportunity;" also the enactment of laws dividing the property of a deceased child equally between its parents and punishing offenses committed during intoxication with double severity. Of his 600 elegiac verses, only four lines remain.

PITTOSPORA'CEÆ, a natural order of exogenous plants, allied to *vitaceæ* (the vine, etc.), and containing nearly 100 known species of trees and shrubs, chiefly Australian, although a few are natives of different parts of Asia, Africa, and the islands of the Pacific. To this order belongs the genus *billardiera* (q.v.). The genus *sollya* also deserves notice, as containing some of our most beautiful green-house climbers.

PITTSBURG, city, port of entry, and co. seat of Allegheny co., Pa.; at the junction of the Allegheny and Monongahela rivers, which here unite and form the Ohio; on the Allegheny Valley, the Baltimore and Ohio, the Pennsylvania, the Pittsburg and Lake Erie, the Pittsburg and Castle Shannon, the Pittsburg Chartiers, and Youghiogheny, the Pittsburg, Cincinnati, Chicago, and St. Louis, and other railroads; 354 miles w. of Philadelphia.

The military importance of the site of Pittsburg was early appreciated by the French and English, who both laid claim to the surrounding country. Following the suggestion of George Washington, who had visited the spot in one of his surveying tours, the English, in February, 1754, began building a stockade here, but were driven away by the French, who erected a fort at the fork of the two rivers and called it Du Quesne. The English made two unsuccessful attempts to regain their territory, the first under General Braddock; but on the approach of a third army, under General Forbes, in November, 1758, the French burned and deserted the fort, and the English, building a new one in 1759, called it Fort Pitt, in honor of William Pitt, the famous British prime-minister. Soon after this some Scotch and Irish settlers arrived, who began a village here; and in 1773 the site was surveyed by members of the Penn family, and the lower part of the city still retains the streets and general arrangement given by them. The post had been abandoned by the British in 1772, and it was claimed by Virginia and held from 1775–79, when the states were divided. In 1786 the first newspaper was printed, and trade with the Indians added greatly to the importance of the infant settlement. To this section came all denominations, but particularly those who were persecuted in the other colonies—Quakers, Baptists, Dunkards, a very peculiar people; Mennonites, or Harmless Christians; Schwenkfelders, Swedish Lutherans, Dutch, and the Society of the Woman in the Wilderness, all astrologers and magicians, and Moravians. And in no part of the country have the people retained the peculiarities of the different sects as here; traces may be seen to this day. Pittsburg took an active share in the "Whiskey Rebellion" (1791–94), which arose from the attempt of Congress to impose a tax of fourpence on each gallon of whiskey. Riots ensued, houses were burned, and troops were called out. In one way good resulted from this excitement, for many of the young men brought here by it remained as settlers. Coal was known to exist in Pennsylvania as early as 1784, when the Penn family sold the privilege of mining to some of the people. Pittsburg was incorporated as a county town in 1791, became a borough in 1804, and a city, March 18th, 1816, although still contracted in area. The first bridges were constructed across the rivers in 1819, and in 1845 the business part of the city was almost entirely destroyed by fire. Fortifications were erected in 1861 which rendered the city secure against sudden attack by the confederates. During the labor strikes of 1877, property worth $8–10,000,000 was destroyed.

The "Iron City" occupies the point of land lying between the Allegheny and Monongahela rivers, near and at the base of the Allegheny mountains. From the low lands on their banks, given up entirely to the immense business interests, the surface rises rapidly to the east with increasing width, until it reaches an elevation of about 400 or 500 feet, where it extends far over the adjoining hills some eight miles up both rivers. The city limits were extended at various times up to 1874, annexing

eleven different townships, and including Allegheny City, on the north side of Allegheny river; although it is separately governed, this city is practically a part of Pittsburg, and connected with it by several bridges. Birmingham, the manufacturing district on the s. side of the Monongahela, also has several bridges, one of them, at the mouth of the river, being considered a marvelous triumph of engineering skill, combining, in iron, both strength and elegance. Among the curiosities of this city are the inclined railways, leading to the summits of Mt. Oliver, Mt. Washington, Duquesne Heights, and other elevated points. The Penn Incline is peculiar in the way in which it is passed over the top chord of the bridge spanning the Pennsylvania railroad at its foot. The view from the top of Mt. Washington, ascended by one of these inclines, of the two cities Pittsburg and Allegheny, the surrounding hills, and the three rivers in their singular junction, somewhat like the letter ⋈ inclined, is exceedingly picturesque, particularly at night. The fierce light of the furnaces and smelting works, with the dense smoke surrounding them, contrasts strongly with the brilliant electric lights, and calls to mind the expression suggested by it, "Hades with the lid off."

Among the noteworthy buildings are the Allegheny co. court house, built of granite from designs by Henry H. Richardson, at a cost of $2,500,000; the U. S. government building cost $1,500,000; Municipal hall, with granite front and high tower, cost $750,000; the Carnegie public library, with art gallery, museum, and music hall, cost over $1,000,000, endowed with $1,000,000 for its art fund, and receiving $50,000 annually from Andrew Carnegie for the purchase of works of art, dedicated in 1895; the West Pennsylvania exposition society's buildings; Y. M. C. A. building; the Pittsburg library; chamber of commerce; South Pittsburg board of trade; Y. W. C. A.; Western state penitentiary; Western state institution for the deaf, dumb, and blind; homeopathic, Mercy, Western Pennsylvania, and South Side hospitals; and home for incurables. The educational and religious institutions include Duquesne college, Holy Ghost college, school of design for women, Pittsburg female college, Pennsylvania female college, several theological seminaries, co. and city medical schools, Bishop Bowman institute, Ursuline academy, and convent of the Sisters of Mercy. The Western university of Pennsylvania is in Allegheny. There are two parks, the Schenley, of 500 acres, a natural preserve, and Highland, of 150 acres. The city is lighted by electricity, has an extensive electric street railroad system, is supplied with water from the Allegheny river by means of the Highland and Herron hill reservoirs, and has public school property valued at over $5,000,000, over 30 national banks, and nearly 200 churches.

Pittsburg well deserves its name of "Iron City," for nothing is too great or too small for its manufactories—bridges, steamboats, cannon balls, locomotives, brakes, shafting, the smallest nail, the most delicate watch-spring. In addition to its favorable position, geographically, Pittsburg has unrivaled advantages by reason of its situation in the center of a region exceedingly rich in bituminous coal, iron, oil, and natural gas, and has easily risen to a position of immense importance in the manufacturing world; 20,600,000 tons of coal are taken annually from the immediate locality to feed its numerous blast-furnaces, iron and steel mills, glass-works, and oil refineries. Natural gas has been known to exist in the United States for nearly a hundred years, but its use for fuel in Pennsylvania began in 1875, and in Pittsburg for iron-working in 1886. It was conveyed in pipes from Murrysville to the city, and the annual consumption once reached as high as 50,000,000,000 cubic feet, one-third of which was used for manufactures. The supply is gradually giving out, so that already its use is discontinued by many mills, on account of the expense. The first rolling-mill was built in Pittsburg in 1812, the first foundries in 1806. The U. S. census in 1890 reported for Pittsburg 1,420 manufacturing establishments, employing $108,368,838 capital and 56,438 persons, paying $33,898,152 for wages and $69,892,195 for materials, and having a combined output valued at $126,859,657. The city is noted for its manufactures of iron and steel, Bessemer steel, locomotives, bridges, glass in a great variety of forms, wrought iron tubes, table-ware, automatic car-couplers, railroad switches, signals, and air-brakes, electrical apparatus, and coke. A single company, controlling many furnaces and iron, steel, bridge, rolling mill, and coke plants, is capitalized at $25,000,000; the plate-glass industry represents a capital of $10,000,000; the wrought iron tube works has an annual output valued at $30,000,000; and over $27,500,000 is invested in electrical plants. The co. produces annually more than half of the plate glass output of the country, one-quarter of all the window glass, and three-fifths of the petroleum oil; and the city, more than half of the Bessemer steel, rolled iron and steel, steel rails, and steel plates and sheets. The city has an enormous trade by rail and water, being a natural distributing point for manufactures and other commodities. In 1896 the debt was less than $9,000,000, and the assessed property valuation, nearly $288,500,000. Pop. '90, 238,617.

PITTSBURG LANDING, Battle of. See Shiloh.

PITTSFIELD, city and co. seat of Berkshire co., Mass.; on the Housatonic river and the Boston and Albany, the Pittsfield and North Adams, and the New York, New Haven, and Hartford railroads; 52 miles w. of Springfield. It was settled in 1743 as Pontoosuck, or Boston plantation; was incorporated as a town under its present name in 1761; was chartered as a city in 1889; and its government was organized under the charter in 1891. It contains nearly a dozen villages, and has electric lights, electric street railroads, water supply from Ashley lake and several brooks, public parks, several national and savings banks, loan and trust company, and daily and weekly newspapers.

The principal industries are the manufacture of cotton and woolen goods, overalls, shirts, knit goods, shoes, brick, paper, paper machinery, electrical machinery, shuttles and bobbins, and brass castings. Among the noteworthy buildings are the co. court house, overlooking a park containing a soldiers' monument; the Berkshire athenæum with public library and art gallery; House of Mercy hospital; Bishop memorial training school for nurses; Berkshire co. home for aged women; high school; and the exhibition buildings of the Berkshire agricultural society. The city has an elevation of 1,000 feet, and is surrounded by high hills. Pop. '90, 17,281.

PITTSTON, a city in Luzerne co., Pa.; on the Susquehanna river near the mouth of the Lackawanna, and on the Lehigh Valley, the Central of New Jersey, the Delaware and Hudson, the Delaware, Lackawanna, and Western, and the Erie and Wyoming railroads; 9 m. s.w. of Scranton. It is the center of the noted Wyoming anthracite coal field, is lighted by gas and electricity, and has electric railroads, national and savings banks, hospital and numerous churches. Pop. '90, 10,302.

PITTSYLVANIA, a co. in s. Virginia, adjoining North Carolina, bounded on the n. by the Staunton river; drained by the Dan and Bannister rivers; traversed by the Southern railroad; about 914 sq. m.; pop. '90, 59,941, includ. colored. The surface is somewhat hilly. The soil is fertile. Co. seat, Chatham.

PITUITARY BODY, a small reddish-gray mass of an oval form, weighing from six to ten grains, and situated on the sella turcica of the sphenoid bone, on the floor of the cavity of the skull. It is very vascular, and in its structure it resembles the ductless glands. In the fetus, it is relatively larger than in the adult, and contains a cavity which subsequently disappears. It was formerly supposed to secrete the fluid yielded by the pituitary membrane of the nostrils. Its function is not known.

PITYRIASIS (from the Greek word *pityron*, bran) is the term given to one of the squamous or scaly diseases of the skin, in which there is a continual throwing off of bran-like scales of epidermis, which are renewed as fast as they are lost. It may occur upon any part of the body, giving rise to brown patches, in which there are sensations of itching, tingling, or pricking. It is more easily cured than the other scaly diseases, and its removal can generally be effected by the frequent use of the warm bath; or, if it fails, recourse may be had to alkaline or sulphur baths. It sometimes occurs on the scalp, when it is known as *dandriff*, and must be treated with weak alkaline lotions, or, if these fail, with tar ointment, provided there is no inflammation.

PITYUSÆ, a group of islands in the Mediterranean sea, off the e. coast of Spain, and belonging to the province of the Balearic isles. Their name is derived from the Greek word for pine-tree, on account of the large number of that variety of trees which grew on the islands. The largest of the islands are Ivica and Formentera. Pop. '87, 24,544.

PIÙ (in Ital. more), as a musical term, when prefixed to another word, intensifies its meaning—e. g., *più mosso*, with more movement.

PIURA, a department of Peru, lying in the northern part of the country on the Pacific coast, and contiguous to Ecuador. In the w. the land is for the most part barren, but at certain seasons affords pasturage for cattle. In the e. the country is broken by a range of the Cordilleras, in which the valleys abound in tropical vegetation. The principal occupations are cotton growing and grazing. Gold, copper, silver, coal, and petroleum are found. Area, 27,201 sq. m.; pop. 1876, 155,502; '94, estimated at 200,000.

PIURA, a city in Peru, cap. dept. Piura; the first city in Peru founded by Europeans, and called originally San Miguel. It is the capital of a province of the same name, on the left bank of the river Piura; pop. about 10,000. Manufactures, soap and leather. The city is connected with its port, Payta, 63 m. distant, by a railroad. The province contains mines of sulphur, iron, lead, sulphate of soda, etc.

PIUS I., Saint, Pope 90–157; b. Italy; pastor of the Roman Christians 117–40, when he succeeded Hyginus as pontiff. He opposed the heresies of Marcion and Valentinus, and the keeping of the feast of the resurrection on Sunday is said to have been ordered by him. His father's name was Rufinus, and the name Pius was given him by the Christians at Rome. The Latin church gives him the title of martyr, but it is not known that he was actually put to death. His anniversary is kept July 11.

PIUS, the name of nine among the Roman pontiffs, of whom the following only appear to call for particular notice.—Pius II., originally known as Æneas Sylvius, was a member of the noble family of Piccolomini, and was b. (1405) at Corsignano, in the duchy of Sienna. His early life was not free from serious irregularities, but he made amends by his subsequent decorous conduct; and his eminent abilities as a canonist led to his being employed, when but 26 years of age, as secretary of the cardinal of Fermo, in a post of the highest confidence at the council of Basel (q.v.). He was intrusted by that council—the views of which, in its conflict with the pope, he fully shared—in several commissions of great importance; and on the election of the antipope Felix V., Æneas Sylvius was chosen as his secretary. But having been sent by him as ambassador to the emperor Frederick III., he was induced to accept office in the imperial court, and served on several embassies and other missions of importance on behalf of the emperor. In the difficulties between Frederick and the pope Eugenius IV., which arose after the council of Florence, Æneas conducted so skillfully a negotiation with which he was intrusted that the pope was induced to retain him in his own court, in the capacity

of secretary. His views of church matters having undergone a considerable change, he continued in equal favor under the successor of Eugenius, Nicholas V., 1447; and under Callistus III. he was elevated to the cardinalate. On the death of Callistus in 1458, he was elected pope, and took the name of Pius II. His pontificate was embarrassed by some contests on German affairs, but it is chiefly rendered memorable by the sustained efforts which Pius—the first in this policy of a long line of pontiffs, to whom the public security of Europe owes a deep obligation—made to organize an armed confederation of Christian princes to resist the progress of the Turkish arms. This organization, however, for a long time did not lead to any considerable results. Pius died Aug. 14, 1464. The literary reputation of the scholar Æneas Sylvius has partially eclipsed the historical fame of the pope Pius. He was one of the most eminent scholars of his age. His works were published at Basel (1 vol. fol., 1551), but many of his works are not included in that edition. They consist chiefly of histories, or historical dissertations and materials of history; but the most interesting portion of his collected works are his letters, which are very numerous, and full of details, characteristic as well of the writer as of the age. The same may be said of a biographical commentary, which is in truth an autobiography, being chiefly written from his own dictation, by his secretary, John Gobellinus, published at Frankfort in 1614. See Voight's *Life of Pius* (Berl. 1856).—Pius IV., Giovanni Angelo Medici, uncle of saint Carlo Borromeo, deserves to be noticed from his connection with the celebrated creed known under his name. He was elected in 1559; and his pontificate is chiefly memorable as that in which the protracted deliberations of the council of Trent (q.v.) were brought to a close. Pius had the duty, in Dec., 1563, of issuing the bull confirmatory of its decrees. The well-known creed called the creed of Pius IV., and sometimes the Tridentine creed, was issued by Pius IV. as an embodiment of all the doctrines defined in that council. Pius died Dec. 8, 1565, in the arms of his nephew, Carlo Borromeo.—Pius V., a saint of the Roman Catholic church, originally named Michele Ghisleri, was b. of poor parents, in the village of Bosco, near Alessandria, in 1504, and at the age of 14 entered the Dominican order. His eminent merits were recognized by Paul IV., who named him bishop of Satri in 1556, and cardinal in the following year. Of austere and mortified habits, he carried into his administration the same rigor which distinguished his personal conduct; and when appointed inquisitor-general for Lombardy he employed the most rigorous measures in repressing the progress of the reformation, which had begun to effect an entrance. He was afterwards translated to the see of Mondovi; and immediately after the death of Pius IV. he was chosen unanimously as his successor, Jan. 8, 1566. Pius carried into his pontifical life the same personal austerity and administrative rigor which he had evinced as a bishop. Applying to others the same rules which he enforced upon himself, he enacted a number of severe laws for the regulation of public morals, prohibiting bull-fights, suppressing prostitution, and proscribing a variety of popular but demoralizing exhibitions. The Roman inquisition, too, under his government, exercised a severity of which no other pontificate has shown any example. He endeavored to enforce everywhere the disciplinary decrees of the council of Trent; and the whole spirit of his pontificate is most strikingly exhibited in the decree by which he ordered the yearly publication of the celebrated bull, *In Cœna Domini* (q.v.). It was an application to the 16th c. of the principles and the legislation of the Hildebrandine epoch. But the most momentous event of the pontificate of Pius was the expedition which he organized, with Spain and Venice, against the Turks, and which resulted in the great naval engagement of the gulf of Lepanto, on Oct. 7, 1571. Pius died in the following May, 1572. He was canonized by Clement XI. in 1712.—Pius VI., originally Giovanni Angelo Braschi, was b. at Cesena, Dec. 27, 1717. He was selected by Benedict XIV. as his secretary; and under Clement XIII. he was named to several important appointments, which led finally, under Clement XIV., to his elevation to the cardinalate. On the death of Clement XIV. cardinal Braschi was chosen to succeed him, Feb. 15, 1775. The conflict with the civil power in the various states of Europe, in which, from the days of Innocent XI., the Roman see had been almost unceasingly involved to a greater or less degree, assumed under Pius what may be called its complete and scientific development. His relations to the emperor Joseph of Austria and the grand duke Leopold of Tuscany, who persisted in the reformation of the religious orders, etc., were far from amicable. The internal administration of Pius, however, was enlightened and judicious. To him Rome owes the drainage of the Pontine marsh, the improvement of the port of Ancona, the completion of the church of St. Peter's, the foundation of the new museum of the Vatican, and the general improvement and embellishment of the city. These and other similar projects were interrupted by the outbreak of the French revolution. In 1793 a popular tumult at Rome, which was caused by the imprudence of a French political agent named De Basseville, and which resulted in his death, gave the French directory an opportunity of hostile demonstrations against the pope. In 1796 Bonaparte took possession of the legations, and afterwards of the march of Ancona, and by a threatened advance upon Rome extorted from Pius, in the treaty of Tolentino, the surrender of these provinces to the Cisalpine republic, together with a heavy war contribution. The year 1797 was marked by a continuance of the same vexatious measures; and at length the directory ordered the invasion of Rome; Berthier entered the city, Feb. 10, 1798, and took possession of the castle of St. Angelo. Pius was called on to renounce his temporal sovereignty, and on

his refusal was seized, Feb. 20, and carried away to Siena, and afterwards to the celebrated Certosa, or Carthusian monastery of Florence. On the threatened advance of the Austro-Russian army in the following year, he was transferred to Grenoble, and finally to Valence on the Rhône, where, worn out by age and by the rigor of confinement, he died in Aug., 1799, in the 82d year of his age and the 24th of his pontificate. Pius VII., originally Gregorio Luigi Barnaba Chiaramonti, was b. at Cesena in 1742. He entered the Benedictine order at an early age, and was employed in teaching philosophy and theology at Parma, and afterwards at Rome. He was appointed bishop of Tivoli; and afterwards, being created cardinal, was translated to the see of Imola. After the death of Pius VI., cardinal Chiaramonti was chosen his successor (Mar. 14, 1800). Rome, which, up to this time, had been in the occupation of the French, was now restored to the papal authority, and in the July of that year Pius VII. entered into his capital; and in the following year the French troops were definitively withdrawn from the papal territory, with the exception of the legations. From this time forward Pius, ably seconded by his secretary of state, cardinal Consalvi, was destined to occupy a prominent place in the political as well as the ecclesiastical affairs of Europe. Bonaparte had resolved to restore religion in France on the ancient basis of connection with Rome. With this view, he entered into negotiations with Pius VII. for the establishment of a concordat suited to the new order of things which had arisen. These negotiations were conducted at Paris, and were attended with many difficulties and delays, until at length cardinal Consalvi repaired in person to the conference, and, by his energy and decision, disentangled the complicated embarrassments in which it was involved. It was agreed to at Paris, July 15, 1801; ratified in Rome, Aug. 14; and published in Notre-Dame on Easter Sunday, 1802. But, simultaneously with the concordat, and as if forming part of the same arrangement, was published a code of what were called "organic laws," seriously affecting the discipline of the church on marriage, on the clergy, and on public worship, which had never been submitted to Pius, and to which he not only had not consented, but to which he found himself compelled to offer every opposition. For the first year which succeeded the publication of the concordat, no occasion of difficulty arose; but conflict of principles was in the end inevitable. In 1804, Bonaparte having resolved on assuming the imperial crown, invited Pius to come to Paris for the purpose of crowning him, and the pope, although with much hesitation, consented. He took advantage of his visit to demand the recall or modification of the articles, but without success; and although, during his visit to Paris, he was treated with great distinction and reverence, his relations with Napoleon from that date began to assume a less friendly character. The French emperor now proceeded from one petty outrage to another, until finally, in Feb., 1808, the French troops, under Gen. Miollis, entered Rome, and took possession of the castle of St. Angelo; and on the 2d of April, a decree was issued annexing the provinces of Ancona, Fermo, Urbino, and Macerata to the kingdom of Italy. Pius, besides protesting against the usurpation, declared himself a prisoner in the French hands, and confined himself to his palace. The papers of the cardinal secretary were violently seized, and the pope was compelled to appoint a pro-secretary; and finally (May 17, 1809), the usurpation was consummated by a decree annexing Rome and all the remaining papal territory to the French empire. This was the signal for the pope abandoning his lengthened policy of forbearance. On June 10, Pius issued a bull of excommunication, directed (without naming Napoleon) against the perpetrators and abettors of the invasion of the rights and the territory of the holy see. Soon afterwards, the French general ordered the removal of the pope from Rome; and Pius, without offering any resistance beyond the declaration that he yielded to force, was removed, first to Florence, then to Grenoble, thence for a longer time to Savona, whence, in June, 1812, he was finally transferred to Fontainebleau. During this prolonged captivity Pius firmly but quietly resisted every effort to compel or seduce him from his policy. At Fontainebleau he was treated with much external respect; and on Napoleon's return from the Russian campaign, in Dec., 1812, orders were given that the cardinals, with certain exceptions, should be admitted to the presence of the pope. Under much pressure, both from the emperor himself—who is alleged by some to have acted with great rudeness, and even with personal violence—and from the ecclesiastics to whom the emperor confided his plans, Pius was induced to sign a new concordat, an important provision of which was the recognition of the annexation of the Roman states to the empire. Having obtained the concession, Napoleon at once permitted the absent cardinals to return, and of these many remonstrated so earnestly against the concordat, that, on March 24, Pius wrote to revoke his consent. Napoleon took no notice of the revocation; nor was it till after the disasters of 1813 that he began to seek an accommodation. Pius refused to treat until he should be restored to Rome; and on Jan. 22, 1814, orders were sent for his immediate return to his capital. Unattended by his cardinals, he was escorted to Italy, and remained at Cesena until the fatal campaign of the spring of 1814 placed Paris in the hands of the allies, when Pius re-entered Rome amidst the gratulations of the people on May 24, 1814—a day since that time held sacred in the Roman calendar. During the Hundred Days, he was again compelled to leave Rome; but, after the campaign of Waterloo, he finally resumed possession, which was undisturbed for the rest of his life, and which extended to the whole of the ancient territory, including the Legations.

The last years of his pontificate were devoted to measures of internal administration;

and under the enlightened government of cardinal Consalvi, were marked by much wisdom and moderation. But the administration chiefly by ecclesiastics and the secrecy of law procedure were resumed. Pius repressed, too, with great vigor the disorder and brigandage which the long wars had introduced, and a whole village of notorious and incorrigible criminality, that of Somma, was razed to the ground in 1819. He was equally vigorous in repressing secret societies, especially that of the Carbonari (q.v.). The ecclesiastical measures of his later period were also of much importance. In 1814 he formally restored the suppressed order of the Jesuits (q.v.). In 1817 and the following years he concluded concordats with Naples, with Russia, Würtemberg, and other courts of Germany. In this and every other period of his life Pius was a model of gentleness, simplicity, benevolence, and Christian charity. In July, 1823, having reached the patriarchal age of 81, he fell accidentally and broke his thigh. He sank gradually, and died Aug. 20, 1823.

PIUS IX., Giovanni Maria Mastai Ferretti, occupant of the papal chair during one of the most eventful periods in the history of the papacy, was born at Sinigaglia, May 13, 1792. He was originally destined for the military profession—the noble guard; but symptoms of an epileptic tendency led to his abandoning his intended profession. He received holy orders, and after exercising his ministry for a time in Rome, was sent as "auditor" of the vicar-apostolic to Chile. Having been successively archbishop of Spoleto and of Imola, nuncio, and cardinal, he was, on the death of Gregory XVI. in 1846, elected "by acclamation" to succeed him. He took the name of Pius IX., and entered at once on a course of reforms, by which he hoped to establish the papal government on a popular, but yet on a firm basis. He resolved to extirpate all abuses of administration, to withdraw the restrictions of personal liberty, to secularize the local administration, and to extend the rights of self-government. His first step to this end was to grant an amnesty; and this measure, however humane and necessary, had the result of drawing together into the Roman states a body of men whom an unhappy experience of foreign exile had embittered against the existing order of things. For a time, the reforming policy of Pius carried with it the affections of the people; but he soon fell short of the expectations which he had created. The outbreak of the French revolution of Feb., 1848, precipitated the crisis of popular discontent. In November of that year, count Rossi, whom the pope had appointed his minister, was assassinated; and violent demonstrations were daily employed to compel the pope's assent to measures which he repudiated. Having at first confined himself to the Quirinal, he at length fled secretly from Rome to Gaeta, a Neapolitan sea-port near the Roman frontier. A republic was proclaimed in Rome, the provisional heads of which proceeded to a complete and radical remodeling of the civil government of the state. Pius from his exile addressed a remonstrance to the various sovereigns. In April, 1849, a French expedition was sent to Civita Vecchia, which eventually advanced upon Rome, and, after a siege of about thirty days, took possession of the city, and established a French army of occupation within the Roman state. The pope's government was re-established, but he himself did not return till 1850, when he again entered upon the administration. In consequence of the unsettled condition of Italy and the failure of many of his early measures of improvement, he declared himself unable to proceed with the reformations which he had contemplated. After that time his authority was maintained without interruption, but the discontent continued. After the war for the unification of Italy, the Legations, Ancona, and a considerable part of the papal territory southward in the direction of Rome, were annexed to the kingdom of Italy, but Pius persistently refused to cede any portion or to enter into any compromise. His ecclesiastical administration continued very active, and proceeded upon the strongest assumption of the right of independent action on the part of the church. In this view he re-established the hierarchy in England, he sanctioned the establishment in Ireland of a Catholic university, and condemned the principles upon which the queen's colleges in that country were constituted. He concluded with Austria a concordat much more favorable to church authority than the existing ecclesiastical laws had permitted. See Concordat. In 1854 he issued a decree propounding as a doctrine of the church the faith of the Immaculate Conception of the blessed Virgin Mary (q.v.). In the internal administration of his states, notwithstanding the embarrassed condition of finances produced by the curtailment of his territory, he introduced many ameliorations, and did much for the advancement and improvement of the city of Rome and of its institutions. In this he was aided by the voluntary contributions of the several churches, as well in special gifts as in the organization of the permanent tribute called Peter-pence (q.v.). In 1864, on occasion of the centenary of the martyrdom of St. Peter, he brought together at Rome a large assemblage of bishops, and subsequently, on occasion of the canonization of the Jesuit martyrs of Japan. But the most important event of his pontificate was the convocation of the Vatican council (see Council), at which bishops from all parts of the Catholic world assembled in Dec., 1869. For the discussions of this council, see Pope. It was adjourned in July, 1870, after it had proclaimed the celebrated decree of the infallibility of the pope, when on a subject of faith or morals he issues a decree *ex cathedrâ* to the universal church. Soon after the adjournment, the Italian army occupied Rome, and declared it the capital of the kingdom of Italy. Pius renewed with all solemnity his oft-repeated protest, and refusing an

offered donation, and all other proposals of accommodation, from that date declared himself a captive in the Vatican, to which he strictly confined himself. In June, 1871, he completed the 25th year of his pontificate, thus exceeding the term of all previous pontificates except that assigned to St. Peter, and falsifying in his own person the traditional prediction that no pontiff would ever "see the days of Peter." His health was for some years precarious; but, with the exception of occasional interruptions, he continued to attend personally to all the public affairs, civil as well as ecclesiastical, of his office. He died Feb. 7, 1878.

PIUTE, a co. in southern Utah, which is drained by the Silver and Dirty Devil rivers; about 3695 sq.m.; pop. '90, 2842, chiefly of American birth. The Wahsatch mountains traverse the w. part. The soil is sterile. Co seat, Junction.

PI-UTES, an Indian tribe of the Shoshone family. They are a migratory tribe of hunters, wandering about New Mexico, Nevada, Utah, and Colorado. They are divided into several tribes and number some 15,000.

PIXLEY-FULFORD, Annie, actress, b. New York, 1855. She made her first appearance on the dramatic stage in San Francisco, 1876, and filled an engagement in Australia in the following year. Her best known parts were "Gretchen" in *Rip Van Winkle*, and "M'liss" in the play of that name. She d. in 1893.

PIZARRO, Francisco, the conqueror of Peru, was an illegitimate son of Gonzalo Pizarro, a col. of infantry, and a soldier of some distinction. He was born at Truxillo, in Estremadura, Spain, about 1471. Of his youth, little is known, but it appears that he was wholly neglected by his parents, was taught neither to read nor write, and that in his youth his principal occupation was that of a swineherd. Abandoning this uncongenial employment, he sought the port of Seville, and there embarked to seek fortune in the new world. He was in Hispaniola in 1510; later, he joined Balboa, and was with that cavalier when he crossed the isthmus of Panama, and discovered the Pacific. In 1515 he was engaged in traffic with the natives on the shores of the newly discovered ocean, but was afterward chiefly employed in military service, in which he showed great bravery, resource, and power of endurance. About this time, when a fresh and powerful impulse was given to adventure by the splendid achievement of Cortes, rumors of a country far s., in which gold and silver were said to be as abundant as iron in Spain, reached Panama, and kindled Pizarro's ambition. He formed a sort of copartnery with Diego de Almagro, an adventurer and a foundling like himself, and Hernando Luque, an ecclesiastic; and with the funds which the three friends amassed, they were enabled to fit out a small expedition, of which Pizarro took command. In Nov., 1524, he set sail southward, but went no further than Quemada point. Making an agreement (dated Mar. 1, 1526), that all lands, treasures, vassals, etc., that should be discovered, were to be equally divided between them, the three friends, Pizarro, Almagro, and Luque, organized a second expedition, consisting of two ships, which set sail for the south seas. Having reached the port of Santa, lat. about 9° s., and having really discovered Peru, Pizarro returned to Panama, carrying with him, however, many beautiful and valuable ornaments in gold, and silver, which he had obtained from the friendly and generous natives, as well as specimens of woolen cloths of silky texture and brilliant hue, and some llamas or alpacas. Unable to find in Panama a sufficient number of volunteers for the invasion of the newly discovered country, the indomitable adventurer returned to Spain in 1528, narrated the story of his discoveries before Charles V. and his ministers, described the wealth of the territories, and showed, as proof the gold ornaments and utensils, the manufactures, etc., which he had brought with him. The result of his representations was, that the right of the discovery and conquest of Peru was secured to him, and honorable titles—among others, those of governor and capt.gen. of Peru—were conferred on him. On his side, he agreed to raise a certain number of followers, and to send to the crown of Spain a fifth of all the treasures he should obtain. Returning to Panama, he set sail for Peru for the third and last time, with a well equipped but small force, the number being not more than 180 men, of whom 27 were cavalry. The chief events of the conquest of Peru are detailed at sufficient length in the article Peru, and also the articles Almagro and Atahualpa. Within 10 years the great *conquistador* made the empire of Peru his own; but he who had surmounted so many stupendous difficulties, who had broken through the lofty barrier of the Andes, and, with his group of followers, been a victor in so many fields, fell a victim to a conspiracy, June 26, 1541.

Pizarro was a soldier of the most undoubted courage, inflexible constancy of purpose, and infinite resource; yet his success in Peru appears to have been more the result of chance than of calculation. His boldest stroke was the seizure of the Inca Atahualpa (q.v.), when surrounded by thousands of his followers; but in doing so, he deserved credit neither for originality nor policy, because the idea was borrowed from Cortes, and the step itself was so foolhardy and desperate, that its success can be regarded only as luck. Although on many occasions he appears to have been guided by noble and generous impulses, he was eminently selfish, perfidious, and relentless. His conquest of Peru is a drama in every act of which there is bloodshed; but the drama is at least consistent to the end. Pizarro lived a life of violence, and died a violent and bloody death.

PIZARRO, Gonzalo, threw in his fortunes with those of his brother Francisco, on the occasion when that leader returned to Spain in 1528. He was, like the great conqueror, illegitimate. He became a soldier at an early age, distinguished himself, before he joined his brother's expedition, by his skill in martial exercises, and when he reached Peru, was esteemed the best lance in the Spanish troop. The territory of Quito was assigned to him by Francisco, and he was enjoined to undertake an exploring expedition to the e., where a land, reputed to be extremely rich in spices, was said to lie. At the head of 350 Spaniards and a great concourse of Indians, Pizarro set out on his famous journey in the beginning of 1540. Marching e., they reached a country traversed by lofty branches of the Andes. Here the icy winds benumbed the limbs of the adventurers as they rose to the higher plateaux, and, rendered helpless by the cold, many of them sank and died. Descending the eastern slopes of the Andes, they reached the "land of cinnamon;" but as they could not transport the trees across the mountains, their discovery was almost valueless. Hearing of a land abounding in gold at the distance of ten days' journey, the leader resolved to reach it. Pushing forward, the Spaniards entered great forests, where often they had to hew a passage with their axes. Their clothes were now torn to shreds, and their provisions had been long exhausted. They killed and ate the dogs they had brought with them, after which they lived on the herbs and dangerous roots of the forest. At length they struck the broad but desolate waters of the Napo, an important affluent of the Amazon. On the surface of this broad river no vesssel floated, and it ran amid gloomy woods, the silence of which was undisturbed save by the sound of the rushing waters. Here Pizarro caused a rude bark to be constructed for the transport of the baggage and of the weaker travelers. Francisco de Orellana was intrusted with the command of the vessel. Pizarro, hearing of a populous nation at the distance of a few days' journey, who dwelt near the confluence of the Napo with a larger river, sent forward Orellana to obtain and bring back supplies for the starving travelers, who had eaten the last of their horses, and were now reduced to the leather of their saddles and belts. Orellana reached the Amazon; but, unable either to obtain supplies, or to return against the current of the river, abandoned the expedition, and with his fifty followers resolved to sail down the Amazon, reach the Atlantic, and make for Spain. This wonderful design was successfully carried out. Pizarro, after waiting in vain for the return of the bark, resolved to return to Quito, which, after enduring terrible sufferings, and seeking fruitlessly for the rich regions of which he had heard so much, he reached in June, 1542, after an absence of more than two years. The fatal character of this expedition may be inferred from the appearance the travelers presented on their return. Half of the 4,000 Indians had perished, and of the Spaniards, only 80 remained; and these, clad in skins, blackened by the sun, and wasted by hunger and fatigue, with long matted locks, seemed like a troop of spectral savages. This expedition stands unmatched in the annals of American discovery for its dangers and sufferings, for the length of their duration, and for the heroic fortitude with which they were endured. For the fate of Gonzalo Pizarro, see article Peru.

PIZZICA'TO (Ital. twitched), abbreviated *pizz.*, a phrase used in music for the violin or violoncello, to denote that the strings, instead of being played as usual by the bow, are to be twitched with the fingers in the manner of a harp or guitar. The pizzicato is much used in accompaniments, as sounds thus produced do not cover the voice; it is also used in symphonic effects. The ordinary mode of playing is restored by the letters *c. a.* (*col arco*, with the bow).

PIZZO, a seaport of South Italy, in the province of Catanzaro, 24 m. s.w. from Catanzaro, on the gulf of Santa Eufemia. It was at Pizzo that Murat (q. v.), the ex-king of Naples, was tried and shot, 1815. He was buried in one of the common vaults of a church to the erection of which he had largely contributed. Pop. 8005.

PLACENTA, or After-birth, a temporary organ that is developed within the uterus during pregnancy, and is, as its popular name implies, expelled from the maternal organism shortly after the birth of the child or young animal. It is a spongy vascular mass, existing in some form or other in all mammals, excepting the *Marsupialia* and *Monotremata,* as an appendage to the fetal membrane called the *chorion.* In the human subject, it is of considerable size at the period of delivery, being of a rounded or oval form, with a diameter of 6 or 8 in., and a thickness of somewhat more than an inch. Its outer surface, which, till the period of its detachment and expulsion, is attached to the walls of the uterus, is uniform and level (unless it has been morbidly adherent), being covered by a membrane, shortly to be noticed, called the *decidua serotina;* and on peeling off this membrane, the various lobes of which the placenta is composed are apparent. The internal or free surface is smooth and shining, and gives attachment to the umbilical cord or navel-string, which connects it with the fetus. To render the mode of formation of the placenta clear, we must premise that the impregnated ovum, when it reaches the uterus, is invested with an outer membrane, the *chorion,* which forms a shut sac, externally covered with short villi. As the ovum advances in age, these villi diminish in number, until few remain, except at that part of the chorion which is in contact with the uterus; and here, about the second month (in the human subject), they divide into branches. While these changes are going on in the membrane of the ovum, the uterus is also undergoing modification; and it is on the nature and extent of these uterine

changes that the character or type of the placenta depends. There are two such types, the first of which is best represented by the human placenta, and the latter by that of the pig.

In animals exhibiting the first type of placental structure, the mucous membrane lining the uterus undergoes a rapid growth and modification of texture, becoming connected with the *membrana decidua*, which is so called from its being thrown off at each parturition. For brevity, it is usually termed the *decidua*. This decidua is from an early period separable into three portions—the *decidua vera*, or *decidua uteri*, which lines the general cavity of the uterus: the *decidua reflexa*, which immediately invests the ovum; and the *decidua serotina*, which is merely a special development of a part of the decidua vera at the part where the villi of the chorion are becoming converted into the fetal portion of the placenta. At first, the villi of the chorion lie loosely in the corresponding depressions of the decidua; but subsequently, the fetal and maternal structures (the villi and the decidua vera) become closely united, so as to form one inseparable mass, by the following means: the deeper substance of the uterine mucous membrane in the region of the placenta is traversed by vessels which enlarge into what, in the case of the veins, are termed *sinuses*, dip down between the villi, "and at last swell round and between them, so that finally the villi are completely bound up or covered by the membrane which constitutes the walls of the vessels, this membrane following the contour of all the villi, and even passing, to a certain extent, over the branches and stems of the tufts."—Goodsir's *Anatomical and Pathological Observations*, p. 60.

The pure maternal blood is conveyed to the placenta by what are termed, from their tortuous course, "the curling arteries" of the uterus, and is returned by the large veins termed sinuses. "The fetal vessels," says Dr. Carpenter, "being bathed in this blood, as the branchiæ of aquatic animals are in the water that surrounds them, not only enable the fetal blood to exchange its venous character for the arterial, by parting with its carbonic acid to the maternal blood, and receiving oxygen from it, but they also serve as rootlets, by which certain nutritious elements of the maternal blood (probably those composing the liquor sanguinis) are taken into the system of the fetus. It is probable, too, that the placenta is to be regarded as an excretory organ, serving for the removal, through the maternal blood, of excrementitious matter, whose continued circulation through the blood of the fetus would be prejudicial to the latter."—*Human Physiology*, 3d ed., pp. 1013, 1014. Moreover, the recent investigations of Bernard show that the placenta secretes, like the liver, the saccharine matter known as glycogen (q.v.), which probably takes part in keeping up the animal heat. The vascular connection between the fetus and the placenta is effected by the umbilical vein (containing arterial blood) and the two umbilical arteries (containing venous blood), all of which lie in the umbilical cord which connects the fœtus (q.v.) with the placenta. The placenta may be formed at any point of the uterus, but is most commonly on the left side. Occasionally (in 11 cases out of 600, according to Naegele), it is situated partially or entirely over the mouth of the womb (*os uteri*), in which case dangerous flooding takes place previous to or at the period of labor. This condition is known as *placenta prævia*, and under ordinary management, "one in three of the mothers are lost, and more than 65 per cent of the children."—Churchill, *Theory and Practice of Midwifery*, 3d ed., p. 473. By substituting the detachment and extraction of the placenta for the old method of turning the child *in utero*, prof. Simpson finds that the mortality sinks to 1 in 14 of the mothers, but slightly rises (to 69 per cent) in the case of the children.

Another difficulty in midwifery practice, but far less serious than the preceding, is undue retention of the placenta. In ordinary cases, the average interval between the birth of the child and the expulsion of the after-birth is a quarter of an hour. When the expulsion does not take place within an hour or an hour and a half, the case is regarded as coming under the head of "retained placenta." It occurs in about 1 case in 400, and in these cases is fatal to about one mother in five; the cause of death being hemorrhage. The principal causes of retention are either imperfect and insufficient, or irregular contraction of the womb after the birth of the child. In the first of these cases, if the uterus cannot be excited to sufficient action, the placenta must be withdrawn by steady traction of the umbilical cord, and if it fail, extraction by the introduction of the hand (an operation always to be avoided if possible) must be resorted to; in the latter case, manual extraction is commonly necessary. Sometimes, in consequence of inflammatory or other affections of the placenta, there may be adhesion between its outer surface and the inner surface of the womb. This is the most dangerous form of retention, there being usually excessive flooding, and additionally the peril arising from the decomposition of any portion that cannot be removed without undue violence.

The placenta acquires its proper character, in the human subject, during the third month, and it subsequently goes on increasing to the full period of gestation. At about the fourth month, the blood, moving through the enlarged uterine vessels, produces a peculiar murmur, which is known as the *placental bruit*, resembling the sound made by blowing gently over the lip of a wide-mouthed phial, and increasing in intensity and strength as pregnancy (of which it is one of the characteristic signs) advances.

In animals exhibiting the second type of placental structure—as, for example, the pig—the placenta is comparatively simple in its structure. "No *decidua* is developed;

the elevations and depressions of the unimpregnated uterus simply acquire a greater size and vascularity during pregnancy, and cohere closely with the chorionic villi, which do not become restricted to one spot, but are developed from all parts of the chorion, except its poles, and remain persistent in the broad zone thus formed throughout fetal life. The cohesion of the fetal and maternal placentæ, however, is overcome by slight maceration or post-mortem change; and at parturition, the fetal villi are simply drawn out like fingers from a glove, no vascular substance of the mother being thrown off." Prof. Huxley, from whose *Elements of Comparative Anatomy* (1864, p. 103) the preceding extract is borrowed, follows the opinion adopted by De Blainville, Von Baer, Eschricht, Milne-Edwards, Gervais, and Vogt in regarding "the features of the placenta as affording the best characters which have yet been proposed for classifying the monodelphous [or placental] mammals." He proposes to apply the term *deciduate* to those animals whose placenta presents the human type, and which throw off a *decidua;* and to term those animals *non-deciduate* in which the placenta is constructed on the same plan as that of the pig. "Thus," he observes, "man; the apes, or so-called *quadrumana;* the *insectivora;* the *cheiroptera;* the *rodentia,* to which the lowest apes present so many remarkable approximations; and the *carnivora,* are all as closely connected by their placental structure as they are by their general affinities. With the pig, on the other hand, the ungulate quadrupeds, and the *cetacea* which have been studied, agree in developing no decidua, or, in other words, in the fact that no vascular maternal parts are thrown off during parturition. But considerable differences are observed in the details of the disposition of the fœtal villi, and of the parts of the uterus which receive them. Thus, in the horse, camel, and *cetacea,* the villi are scattered as in the pig, and the placenta is said to be *diffuse;* while in almost all true *ruminants,* the fœtal villi are gathered into bundles or cotyledons, which in the sheep are convex, and are received into cups of the mucous membrane of the uterus; while in the cow, on the contrary, they are concave, and fit upon corresponding convexities of the uterus."

The *diseases* of the human placenta had not been studied with any accuracy, until the subject was taken up by Prof. Simpson. This distinguished physician and subsequent observers have ascertained that the placenta is liable to (1) congestion, ending in the effusion of blood into the substance of the organ upon its surfaces, or between the membranes; (2) inflammation, giving rise to adhesions, or terminating in suppuration, which may occasion very serious constitutional disturbances; (3) partial or entire hypertrophy or atrophy; and (4), fatty degeneration, affecting its small vessels.

PLACENTA, in botany, a membrane of the interior of the germen (q.v.) or ovary, to which the ovules are attached either immediately or by umbilical cords (q.v.). The placenta sometimes appears as a mere thickening of the walls of the germen. In many cases, it is a more decided projection from the walls of the germen. When thus connected with the walls of the germen, the placentæ are described as *parietal* (Lat. *paries,* a wall). But in some plants, the placentæ of the different cells of the germen are united together in a column in its axis, and they are then described as *axile.* This distinction is of great importance as characterizing different natural orders. Parietal placentæ are formed where the edges of carpellary leaves unite; but great difficulty has been experienced by vegetable physiologists in explaining the formation of axile placentæ; some regarding them as also originally formed in this manner, and others as formed in a quite different manner from the axis itself; nor is it impossible that both theories may be correct as to different orders of plants. It is certain that in many cases in which the placentæ appear as axile, they are formed from the edges of the carpellary leaves which fold in to meet in the axis, and form *dissepiments* (q.v.) between the cells of the germen. The number of placentæ corresponds with the number of carpels in the germen, or appears to be the double of it, each carpel producing two rows of ovules instead of one. See article Pistil.

PLACENZA. See Piacenza.

PLACER, a co. in e. California, adjoining Nevada, bounded on the e. by lake Tahoe, on the s. by the middle fork of the American river, on the n.w. by Bear river, drained by the n. fork of the American river, traversed by branches of the Southern Pacific railroad; about 1492 sq. m.; pop. '90, 15,001, chiefly of American birth. The surface is uneven, crossed in the e. by the Sierra Nevada, and covered with great forests of pine. The rivers flow in deep, narrow canyons. Co. seat, Auburn.

PLACETUM REGIUM, called also Placet, Exevuatur, Lettres Patentes, is an act or instrument executed in virtue of the privilege claimed by the government in certain kingdoms to exercise a supervision over the communications of the Roman pontiff with the clergy and people of those kingdoms, and to suspend or prevent the publication of any brief, bull, or other papal instrument which may appear to contravene the laws of the kingdom, or to compromise the public interest. The early Christian emperors, it is well known, freely stretched their legislation into the affairs of the church; and one constant cause of conflict between church and state in the mediæval period was the attempt, on the part of the sovereigns, to control the free intercourse of the pope with the several churches. In the pragmatic sanction in France, and in the similar legislation of Spain, Portugal, Sicily, and the Low Countries during the 15th c., the claims of the state on the same head are more than once asserted; and among the so-called "liberties" of the later Gallican church was a certain though not a complete subjection to the state in this particular; but it was in the

German states that this claim was most distinctly asserted, and most formally embodied in the constitutional law. The principle upon which the peace of Westphalia, so far as regards its religious provisions, is based, is that the will of the sovereign of the state is supreme and final in all the concerns of religion. *Cujus regio illius et religio* ("Whose the territory, his also the religion") became the maxim of church government; and, of course, within certain limits, the Catholic sovereigns acted as freely upon it as the Protestant. This intermixture of the spiritual and the temporal prevailed especially in the mixed governments of the ecclesiastical sovereigns of Germany, the prince-bishops of the Rhine; but without the same foundation, the system was carried to its height in Austria under Joseph II. (see FEBRONIANISM, PIUS VI.), the excessive minuteness of whose ecclesiastical ordinances procured for him the sobriquet of "The Sacristan." Under him all pontifical bulls, briefs, and constitutions, and all the ordinances of the local bishops, were made subject to the imperial censorship, and it was forbidden to publish any of them without its receiving the *placet* of the emperor. The only exception, in the case of pontifical decrees, regarded those emanating from the Roman penitentiary (q.v.), which, as being of their nature secret, were not held subject to revision. In Prussia the same law was enforced, as also in Baden and Saxony, no less than in the Protestant governments of Würtemberg, Saxe-Gotha, Saxe-Weimar, etc. These claims of the state had always been the subject of protest on the part of the Roman see, but the church, nevertheless, had been compelled to acquiesce silently in the enforcement. In many cases, however, they have led to serious disputes, of which the mixed-marriage question in Prussia furnished a few years ago a very remarkable example. And since the ascendency obtained by Prussia in the German empire at the close of the Franco-German war, the system of church legislation has undergone a complete change, the details of church government being largely taken into the control of the state, and obedience to the new code of church laws being exacted from the clergy under penalty of forfeiture of income, of deprivation of office, and in some cases of exile. See CULTUR KAMPF.

PLA'COID FISHES, an order of fishes, in the classification proposed by Agassiz, characterized by having *placoid* (Gr. *plax*, a broad plate) scales, irregular plates of hard bone, not imbricated, but placed near together in the skin. These scales or plates are of considerable size in some fishes, but in others they are very small tubercles, as in the dog-fish, of which the skin forms fine-grained shagreen. Agassiz includes among the placoid fishes those cartilaginous fishes which have no scales. The order is exclusively composed of *cartilaginous fishes* (q.v.).

PLAGIARISM (L. Lat. *plagium*, kidnapping or stealing) is taking the words or thoughts of another and using them as our own in literary composition, without due acknowledgment. It has been practised by writers in all classes of literature, but, perhaps, in none so widely as in the drama. Shakespeare borrowed nearly all his plots from novels, romances, or older plays. One writer counts "as many as 1771 lines," he knew to be borrowed, while another writer remarks that it is even doubtful if Shakespeare wrote any of the first part of *Henry VI.* Early in the seventeenth century, Thomas Middleton was the author of an old drama that would have been forgotten long since, but for the accusation that his witchcraft scenes and incantations were plagiarisms on *Macbeth*. Boucicault was the author of many plays, several of which were adapted from the writings of others, and in a number of them the charge of plagiarism was brought against him. And, in the field of romance the charge is very common. Even so great a writer as George Eliot is charged with plagiarizing Scott's *Heart of Mid-Lothian* in her *Adam Bede* and again Reade's *Cloister and Hearth* in *Romola*. Mrs. Burnett, in *Little Lord Fauntleroy*, is also charged with plagiarizing from a story entitled *Wilfred*, by Mrs. A. T. Winthrop, and the same writer who makes the charge against Mrs. Burnett calls Rider Haggard "the chief of the royal school of plagiarists," citing his wholesale use, in *Allan Quartermain*, of material taken from a book of travels by Mr. E. F. Knight, entitled, *The Cruise of the Falcon;* and again in *Mr. Meeson's Will*, from a sketch contributed to the *Illustrated London News*, by James Runciman. Yet, notwithstanding all that is said on the subject, much is called plagiarism that is not such, for it is still true that *facts* are common property to all who know how to use them.

PLA'GIOSTOMI (Gr. transverse-mouthed), an order of fishes, in the system of Müller, containing the cartilaginous fishes with placoid (q.v.) scales, and divided into two sub-orders, one containing sharks, and the other rays. The plagiostomi have five or six more gill-openings. They have no air-bladder.

PLAGUE, a very malignant kind of contagious fever prevailing at certain times and places epidemically, characterized by buboes, or swellings of the lymphatic glands, by carbuncles and petechiæ, and not apparently furnishing any security against its recurrence in the same individual. For a history of the origin of the plague in the far east (China), and its gradual spread, under the name of the *black death* (q.v.), through Asia and Europe, in the 14th c., the reader is referred to Hecker's *Epidemics of the Middle Ages* (1844, published by the Sydenham society). Its true and permanent home seems to be in the regions bordering upon the eastern extremity of the Mediterranean. At different periods of the 15th, 16th, and 17th centuries, it visited western Europe. It last

attacked London and almost all England in the years 1663–65; while so late as 1720, it destroyed nearly half the population of Marseilles; and seventy years afterwards, prevailed in Russia and Poland, since which time it has been almost unknown in western Europe. It is now limited chiefly to Egypt, Syria, Anatolia, Greece, and Turkey, occasionally extending northward towards Russia, and westward as far as Malta.

The disease usually commences with a sensation of intense weariness and fatigue, slight shivering, nausea and sickness, confusion of ideas, giddiness, and pain in the loins. These symptoms are rapidly followed by increased mental disturbance, with occasional stupor and delirium, by alternate pallor and flushing of the face, by suffusion of the eyes, and a feeling of intense constriction in the region of the heart. Darting pains are felt in the groins, armpits, and other parts of the body, which are soon followed by enlargements of the lymphatic glands, or *buboes* (which sometimes appear on the first and second day, sometimes not till near the close of the disease, and sometimes are altogether absent), and by the formation of *carbuncles* on various parts of the body. As the disease advances, the tongue becomes dry and brown, while the gums, teeth, and lips are covered with a dark fur; the bowels, at first constipated, become relaxed, the stools being dark, offensive, and sometimes bloody. The power of the will on the muscles is much impaired; and altogether the patient resembles a person under the influence of intoxication. Throughout the disease, there is more or less tendency to faintness; and usually about the second or third day, petechial spots, livid patches like bruises, and dark stripes (called *vibices*), appear upon the skin, especially in severe cases. These discolorations are owing to the extravasation of blood, and are often accompanied with hemorrhagic discharges from the mucous membranes cases, the pulse gradually sinks, the surface becomes cold and clammy, blood oozes from the mucous surfaces, there is coma, or low delirium; and death occurs usually in five or six days, either without a struggle, or preceded by convulsions.

Great difference of opinion exists as to the cause of plague. Some maintain that it is propagated exclusively by a peculiar contagion; others, while admitting its contagious nature, maintain that it may also be spontaneously engendered by endemic or epidemic influences; while others, again, reject the contagion view altogether, and assert that it originates exclusively in local causes or epidemic influences. Of these three views, the great mass of evidence goes to show that the second is the correct one. Whatever may be the cause of the disease, temperature appears to exert a considerable influence over it. In tropical climates, the disease is unknown, and the cold weather of northern climates has been observed to check its ravages. In Europe, it has always been most fatal in the summer and autumn, especially in September. Thus, in the plague of London in 1665, the deaths from the plague were, in June, 590; in July, 4,129; in August, 20,046; in September, 26,230; in October, 14,373; in November, 3,449; while in December, they were less than 1000.

The exact nature of the disease is unknown. A poison whose characters evade all chemical and microscopical examination is absorbed and alters at once, or after a short stage of incubation, the composition of the blood and the condition of the tissues.

With respect to treatment, little can be done to arrest the progress of the disease in any individual case. The patient should, if possible, be removed at once from the source of the disease; he should be exposed freely to fresh air; his secretions should be duly regulated, and his strength supported as far as possible. Friction with olive oil has been strongly recommended, but subsequent experience has not confirmed the first reports in its favor. But although treatment is comparatively valueless, much may be done toward guarding against the attacks of the disease. There can be little doubt that it is in consequence of the free external use of cold water, perfect cleanliness, moderate habits of life, and superior ventilation that European (especially English) residents in the infected cities of the Levant are comparatively exempt from this disease. It is very possible that inunction of the body with olive oil may be (as has been asserted) a useful prophylactic agent, although it fails to cure the disease. It is almost needless to add that all unnecessary communication with the sick, or contact with clothes or other matter that may have been infected with the poison, should be as much as possible avoided.

PLAGUE, SOUTHERN CATTLE. See Texas Cattle Disease.

PLAICE, *Platessa vulgaris*, a species of flounder (q.v.), much resembling the common flounder, but rather broader in proportion to its length; the upper surface of the body and the fins olive-brown, marked with large bright orange spots; a row of similar spots on the dorsal fin and on the anal fin; no tubercular asperities on any part of the body, but a curved row of bony tubercles on the eye-side of the head. The plaice inhabits sandy and muddy banks, not in very deep water, and is very abundant on most parts of the British coasts, as well as on those of continental Europe. Like the common flounder, it often ascends slow rivers to some distance from the sea, and it has even been found to thrive well when transferred to fresh-water ponds. It feeds on worms, mollusks, small crustaceans, and young fishes. It has been known to attain the weight of fifteen pounds, but a plaice of seven or eight pounds is accounted large. It is taken both by lines and trawl-nets. It is in considerable esteem for the table, although so plentiful in the British markets that it is in general very cheap.

PLAID, a woolen garment, in the form of a large scarf, to wrap round the body, and used chiefly among the rural population of Scotland. See TARTAN.

PLAIN, in geography, is an extensive tract of country which, on the whole, preserves a nearly uniform elevation. When referred to the level of the sea, plains may be distinguished into low plains or lowlands, and elevated plains called plateaux or *table-lands* (q.v.). Plains differ much in appearance, according to the nature of their soil and climate, from the frightful sandy wastes of Africa, to the luxuriant fertility of the South American silvas. They are occasionally crossed by hills of moderate altitude, which, however, are generally detached, and exhibit no connection with any neighboring mountain system. These hills often, as in the North American plains, degenerate into mere undulations, perfectly uniform in structure. The term "plains" is, in a limited sense, confined to the plains of western Europe; those of other parts of the world receiving special designations, and differing from each other in many important points; thus, we have the *steppes* (q.v.) of eastern Europe and Asia; the *deserts* (q.v.) of Arabia and Africa; the *savannahs* (q.v.) and *prairies* (q.v.) of North America; and the *llanos* (q.v.), *pampas* (q.v.), and *silvas* (q.v.) of South America. The chief plains of Europe are, the country stretching from the foot of the Carpathians in Galicia to the Ural mountains (including Poland and Russia), the drainage-area of the Danube in Hungary, and the portion of Europe which is bounded by the Elbe, the Harz mountains, France, and the sea.

PLAINFIELD, a city in Union co., N. J.; on the Central of New Jersey railroad; 25 miles w.s.w. of New York. It is principally a place of residence of New York business men, and has the Muhlenberg hospital, public library, electric light and street railroad plants, national and savings banks, about 15 churches, several newspapers, machine tool works, and two large printing press factories. Pop. '90, 11,267.

PLAINFIELD, a town in Windham co., Conn.; on the Quinebaug and Moosup rivers and branches of the New England railroad; 55 miles e. by s. of Hartford. It contains several villages; was incorporated in 1699; and has public libraries at Moosup and Plainfield villages, cotton and woolen mills, thread and yarn factories, foundry, and wagon shops. Pop. '90, 4,582.

PLAINS, a township and village in Luzerne co., Pa.; on the Susquehanna river and the Lehigh Valley, the Delaware and Hudson, the Central of New Jersey, and the New York, Susquehanna, and Western railroads; 3 miles n. of Wilkesbarre. It contains the site of the first settlement in the Wyoming valley, high school, and electric light and street railroad plants, and is principally engaged in coal mining. Pop. '90, 6576.

PLAIN'-SONG, or CANTO FERMO (Ital.), a name given by the church of Rome to the ecclesiastical chant. It is an extremely simple melody, admitting only notes of equal value, rarely extending beyond the compass of an octave, and never exceeding nine notes, the staff on which the notes are placed consisting of only four lines. The clefs are C and F. St. Ambrose is considered to have been the inventor or systematizer of plain-song. His labors consisted in selecting from the extremely complicated system of the Greeks a set of scales sufficiently few and simple for a very rude people. During the two centuries succeeding the death of Ambrose, his institutions fell into utter confusion. Gregory the great revived and perfected them, recasting them into an *antiphony*, or authorized body of ecclesiastical music, and brought plain-song into the state in which it is yet used in the Roman church. See AMBROSIAN CHANT and GREGORIAN CHANT.

PLAIN'TIFF, in England and America, is the name given to the person who institutes and maintains a civil action or suit against another, who is called the defendant. In Scotland a plaintiff is called a pursuer. But in both countries many proceedings and applications of a civil nature are commenced by petition; and hence the party taking the initiative is called the petitioner.

The plaintiff, in fact, corresponds to the complainant in equity proceedings, the libelant in admiralty suits, and the complainant in the old "real actions." A distinction exists at common law between the legal and equitable plaintiff; the former is the man in whom the legal right of action is vested; the latter he who is equitably entitled to the relief or damages sued for. Thus if A brings an action for the use or benefit of B, A is the legal and B the equitable plaintiff. In the system of pleading and procedure now in use in most states, the name of the party really interested is inserted in the declaration and the old distinction abolished. The plaintiff in error is the party suing out a writ of error for the purpose of appealing to a higher court and may be either the plaintiff or defendant in the original suit. A plaintiff *ad litem* is one appointed to represent an insane person or minor for the purpose of prosecuting the suit.

PLAN, a word frequently applied to all kinds of architectural drawings, but which ought to be limited to those which represent the horizontal sections of the various floors of buildings. Plans show the disposition of the apartments and walls, with the situation of the fire-places, cupboards, doors, etc.; they, in fact, represent the different stories as they actually appear as seen from above, when the walls are built two or three feet above the level of each floor.

PLANA, GIOVANNI ANTONIO AMADEO DE, Baron: 1781–1864; b. Italy; educated at the Paris polytechnic school. He held the chair of mathematics at the Alessandria artillery school, 1803–11, when he became prof. of astronomy at the univ. of Turin. In 1813 he was made director of the Turin observatory. His most important works are a treatise *On the Theory of the Attraction of Elliptical Spheroids*, 1810; and *Theory of the Movement of the Moon*, 1832. He was made baron and senator, and elected to the French academy.

PLANA'RIA, a genus of worms placed by Cuvier among *entozoa*, although not parasites, but inhabitants of stagnant waters, because of their great resemblance to some of the entozoic parasites, and particularly to flukes. The species are numerous. Some inhabit fresh, and others salt water; they feed on small annelids, mollusks, etc. They are generally found creeping among confervæ, or on the stems of plants. Many of the larger marine species are able to swim freely by flappings of the broad margins of their bodies. The body of a planaria seems to be entirely gelatinous; but M. de Quatrefages has detected under the skin an arrangement of muscular fibers. Two red specks in the fore-part of the body of many species have been supposed to be eyes; but there is no proof of it. Planariæ are hermaphrodite, but copulate for mutual impregnation. Their power of multiplication by division is very great; if an individual be cut in pieces, each piece continues to live and feel, and "even if it be the end of the tail, as soon as the first moment of pain and irritation has passed, begins to move in the same direction as that in which the entire animal was advancing, as if the body was actuated throughout by the same impulse; and, moreover, every division, even if it is not more than the eighth or tenth part of the creature, will become complete and perfect in all its organs."—*Rymer Jones.*

PLANCHÉ, James Robinson, 1796–1880; b. London; was successful as a writer of more than 200 pieces for the stage; some of which were translations from the French. His first work was a burlesque called *Amoroso, King of Little Britain.* In 1826, having traveled on the continent, he published *Lays and Legends of the Rhine;* 1827, *Descent of the Danube;* 1828, *Charles* XII., one of his best works. In 1830 he was chosen a member of the antiquarian society; and appointed Somerset herald, 1866. Among his numerous publications are: *History of British Costume; Regal Records; The Pursuivant of Arms, or Heraldry founded upon Truth; King Nut-Cracker, a Fairy Tale; Popular Fairy Tales Illustrated; Recollections and Reflections, a Professional Autobiography; The Conqueror and his Companions.*

PLANCHE, Jean Baptiste Gustave, 1808–57; b. Paris; educated at the Bourbon college. He was a contributor to the *Revue des Deux Mondes,* an associate of Balzac on the *Chronique de Paris,* and a writer on Italian art.

PLANCHETTE (a little board) is, as the name implies, a French invention, but its former use in America has induced the belief of its being of American origin. It consists of a heart-shaped board seven or eight inches at its greatest breadth and length, mounted on two pentagraph wheels, about two inches high, at its widest part, while a pencil fastened at the apex forms its third support. Placed upon a table with a sheet of paper under it, and one or two persons with the necessary qualifications having their hands upon its tablet, setting it in motion, it is found to return answers to questions sometimes of a puzzling character. These answers are asserted by believers in spiritualism to be communications from the spirit-world.

PLANCUS, Lucius Munatius, b. at Tibur near Rome; in youth one of Cicero's pupils and later an officer of Cæsar in the Gallic wars. After the assassination of Cæsar, Plancus at first favored Brutus, but soon went over with four legions to Antony. In B.C. 42 he was consul with Lepidus. In the contest between Antony and Octavius, he sided with the latter, and proposed in the senate the title of Augustus. Plancus was a man of some literary taste and to him one of Horace's odes is addressed.

PLANE, in geometry, is a surface without curvature, and the test of it is, that any two points whatever being taken in the surface, the straight line which joins them lies wholly in the surface. When two planes cross or intersect one another, their common section is a straight line; and the inclination of the planes to each other is measured by taking any point in their common section, and drawing from it two straight lines, one in each plane, perpendicular to the common section; the angle contained by these lines is the angle of inclination of the planes. When the angle is a right angle, the planes are perpendicular to each other.

PLANE, *Platanus,* the sole genus of trees of the natural order *platanaceæ,* regarded by many as a suborder of *amentaceæ* (q.v.). The flowers are in globose, small, pendulous, long stalked catkins, which give the tree a peculiar appearance in winter; the ovary is one-celled, and contains one or two pendulous ovules. The species of plane are very few; natives of temperate climates in the northern hemisphere; tall trees, with deciduous large palmate leaves, and smooth whitish bark, which annually scales off in large pieces. The Oriental Plane (*P. orientalis*), a native of Greece and the east, was planted by the Greeks and the Romans as an ornamental tree; no other tree, indeed, commanding equal admiration; and, for centuries, the youth of Greece assembled under its shade in the groves of Academus, to receive lessons in philosophy. The plane is still planted for shade and ornament in the south of Europe. Many fine trees exist in England, but they were at one time much more numerous, great part having died in the end of last century. The spring frosts, and the insufficient duration of the summer for the proper ripening of the wood, render Scotland less suitable for its cultivation; yet there is a tree at Gordon castle 66 ft. high. No tree better endures the atmosphere of a large city, and there are no finer trees within the precincts of London than its plane trees. In the east the plane

attains an immense size. One tree, in the meadow of Buyukdere on the banks of the Bosporus, is 141 ft. in circumference at the base, extends its branches 45 ft. from the trunk, and is believed to be more than 2,000 years old. The wood of the plane, when young, is yellowish-white; when old, it is brownish, fine grained, takes a high polish, and is esteemed for cabinet-making. A rich alluvial soil and the vicinity of water are most suitable to this tree.—The North American Plane, or Buttonwood (*P. occidentalis*), is a very similar tree. It is the largest deciduous tree of the United States, and abounds on the banks of the great rivers of the middle states. Its timber is not very valuable, and is very liable to decay. A tree of this species on the bank of the Thames, in Chelsea hospital gardens, is 115 ft. high, with a trunk five ft. in diameter. The name plane-tree is commonly given in Scotland to the sycamore (*acer pseudo-platanus*), which resembles the true planes in its foliage. See illus., Hazel, vol. VII.

PLANE, a tool used for rendering the surface of wood smooth and level. It consists of an oblong block of wood or metal (the latter has only recently come into use), with an opening through the center; this opening is square on the upper side, and is always large enough to admit the cutting instrument; it diminishes down to a mere slit on the under side, just wide enough to allow the cutting edge of the plane-iron and the shaving of wood which it cuts off to pass through. The essential part of the tool is the plane-iron, a piece of steel with a chisel-shaped edge, and a slot in its center for a large-headed screw to work and to attach to it a strengthening plate. They are held in place by the hard-wood wedge. By driving in the wedge, the irons are held very firmly in their place, and they are so adjusted that only the fine sharp chisel-edge of the cutting-tool projects through the slit in the bottom of the body of the plane, so that when the tool is pushed forward by the force of the hand, the cutting edge pares off all irregularities, until the wood is as smooth as the under surface of the plane. There are many modifications in this tool, which can have its cutting edge and under surface made to almost any contour, so that moldings of all kinds may be made. The two commonest are the jack-plane for rough work, and the smoothing-plane for finishing off plane surfaces.

Planing-machines have lately been much in use, by which both wood and metal are planed. In the case of those intended for wood, the cutting instruments are moved forward over the wood by machinery in the same manner as in the hand-plane. The precision and rapidity with which these machines work have given great facilities for building, as one machine will do as much work as sixty men. The planing-machines used for metal are different in principle. A well-tempered, chisel-edged steel cutter is held in a fixed position, pressing downwards upon the metal plate, which is moved forward by powerful machinery. The action of this movement is that a groove is plowed into the metal of the size of the steel cutter; when the metal has traveled its full length, and has made the groove complete, the downward pressure of the tool is removed, and by the action of the double screw which has carried it forward, it is returned, and readjusted for another groove to be formed by the side of the first; and this is repeated until the whole surface of the plate is reduced to the required level. However tedious this process may appear, it offers remarkable facilities for metal working.

PLANER TREE, found on swampy lands in the southern states, is like the elm in general appearance, but has a different flower and fruit; of moderate size, and supplies hard timber, useful for various purposes. A species found in the Levant has aromatic wood—the Cretan false sandal-wood mentioned by old writers. A third species, a native of Persia and the Caucasus, has been introduced into Europe; it is tall and handsome, and furnishes excellent timber.

PLANET, Intra-Mercurial, The. See Vulcan; Planets; Planetoids.

PLANE'TA, the Greek name of the vestment called by the Latins casula, and in English "chasuble," which is worn by priests in the celebration of mass. The form of this vestment in the modern Roman church differs both from the ancient form and from that in use in the Greek church. The change appears to date from the 9th c., but has been gradual. A certain modification of the Roman planeta was recently introduced in England under the inspiration of the late Mr. Pugin, the great reviver of Gothic architecture and ecclesiastical costume and decoration. But its use has been only partial even in England.

PLANETA'RIUM, a machine much employed by astronomers in the 17th and 18th c., and first constructed by Huyghens and Römer, for the purpose of exhibiting clearly the motion of the heavenly bodies in conformity with the Copernican doctrine. The planetarium exhibited only the orbital motions of the planets about the sun, either in circles or ellipses, and with constant or varying motions, according to the perfection of the machine. It was subsequently supplemented by the *combined tellurian and lunarian*, which exhibited at one and the same time the motion of the moon about the earth and that of the latter round the sun, with the principal phenomena (such as the succession of day and night, the varying length of each, eclipses, and the motion of the moon's apogee and nodes) which accompany these motions. A *satellite machine* was also invented to illustrate the motions of Jupiter's satellites. All these machines are now combined in the Orrery (q.v.), which exhibits in the best manner possible the varied motions and phenomena of the bodies in the solar system.

PLANETOIDS, or ASTEROIDS, the name given to that numerous group of very small planets which are situated in the solar system between Mars and Jupiter. Till the present century they remained undiscovered; but for some years before, their existence had been suspected, mainly owing to the remarkable hiatus in the series of the planetary distances when compared with the law of Bode (q.v.). On the first day of the present century the first of them was detected by Piazzi of Palermo, and his success roused his brother astronomers to search for more planets. Their search was successful, for Olbers (q.v.) discovered two in 1802 and 1807, and Harding one in 1804; but as all researches for some time subsequent to 1807 were unavailing, astronomers gradually allowed themselves to settle down into the belief that no more planetoids remained to be discovered, when the detection of a fifth by Hencke in 1845 revived the hope of fresh discoveries, and from this period no year (excepting 1846) has passed without adding to the list. The number now known is more than 170. This remarkable success of the astronomers of our time is due to the systematic manner in which the zodiacal belt has been explored, and the place and apparent size of every star of this region distinctly determined; so that the presence of a wandering body can at once be detected.

The magnitudes of these celestial bodies have not been accurately ascertained, but it is certain that they are exceedingly small as compared even with Mercury, the least of the other planets; the diameter of the largest among them being generally believed not to exceed 450 miles, while most of the others are very much smaller than this. They also differ, generally speaking, from the rest of the planets in other respects; their orbits are of greater eccentricity, are inclined to the ecliptic at a greater angle, and are interlaced in a most intricate manner, crossing each other so frequently as to form, when viewed perpendicularly, a kind of net-work. The consequence of this is that a planetoid which is nearest the sun at one part of its orbit is, when at another part of its orbit, further from it than are several of the others, and a mutual eclipsing of the sun at different periods by two planetoids must be of very frequent occurrence. Of the planetoids, of which the elements had in 1876 been satisfactorily calculated, Flora had the shortest period of revolution, 1193 days, and Sylvia the longest, 2,374 days. The corresponding mean distances from the sun, expressed in parts of the earth's mean distance, are respectively 2.201 and 3.484. [But it is now known that Hilda has a period of 2,868 days and a mean distance of 3.95228.] The nearest approach to the sun is made by Phocea (perihelion distance, 1.787). Freia recedes furthest from him (aphelion distance, 4.002). Polyhymnia's orbit has the greatest excentricity, amounting to 0.33998; Lomia's, the least, 0.2176. Massalia's orbit makes a smaller angle—only 41′ 7″—with the ecliptic than that of any other planet in the solar system, while the inclination of the orbit of Pallas is no less than 34° 42′ 41″. After the first two or three of these bodies had been discovered, the opinion was propounded by Olbers that they were but the fragments of some large planet; and this hypothesis received corroboration from the intimate connection which was shown to subsist among them; but of late years it has fallen out of favor with astronomers. Some infer that the planetoids are best accounted for by the nebular hypothesis. It has been calculated that the combined mass of all the planetoids cannot exceed one-fourth of the earth's mass. The following were known in Feb., 1877:

Name.	Date of Discovery.	Discoverer.	Name.	Date of Discovery.	Discoverer.
1. Ceres	1801, Jan. 1	Piazzi, Palermo.	30. Urania	1854, July 22	Hind. [ton.
2. Pallas	1802, Mar. 28	Olbers, Bremen.	31. Euphrosyne	" Sept. 1	Ferguson, Washing-
3. Juno	1804, Sept. 1	Harding, Bremen.	32. Pomona	" Oct. 26	Goldschmidt.
4. Vesta	1807, Mar. 29	Olbers. [(Prussia).	33. Polyhymnia	" Oct. 28	Chacornac, Paris.
5. Astræa	1845, Dec. 8	Hencke, Driesen	34 Circe	1855, Apr. 6	Chacornac.
6. Hebe	1847, July 1	Hencke.	35. Leucothea	" Apr. 19	Luther.
7. Iris	" Aug. 13	Hind, London.	36. Atalanta	" Oct. 5	Goldschmidt.
8. Flora	" Oct. 18	Hind.	37. Fides	" Oct. 5	Luther.
9. Metis	1848, Apr. 25	Graham, Sligo.	38. Leda	1856, Jan. 12	Chacornac.
10. Hygieia	1849, Apr. 12	De Gasparis, Naples.	39. Lætitia	" Feb. 8	Chacornac.
11. Parthenope	1850, May 11	De Gasparis.	40. Harmonia	" Mar. 31	Goldschmidt.
12. Victoria	" Sept. 13	Hind.	41. Daphne	" May 22	Goldschmidt.
13. Egeria	" Nov. 2	De Gasparis.	42. Isis	" May 23	Pogson, Oxford.
14. Irene	1851, May 19	Hind.	43. Ariadne	1857, Apr. 15	Pogson.
15. Eunomia	" July 29	De Gasparis.	44. Nysa	" May 27	Goldschmidt.
16. Psyche	1852, Mar. 17	De Gasparis. [dorf).	45. Eugenia	" June 27	Goldschmidt.
17. Thetis	" Apr. 17	Luther, Bilk (Düssel-	46. Hestia	" Aug. 16	Pogson.
18. Melpomene	" June 24	Hind.	47. Melete	" Sept. 9	Goldschmidt.
19. Fortuna	" Aug. 22	Hind.	48. Aglaia	" Sept. 15	Luther.
20. Massalia	" Sept. 19	De Gasparis.	49. Doris	" Sept. 19	Goldschmidt.
21. Lutetia	" Nov. 15	Goldschmidt, Paris.	50. Pales	" Sept. 19	Goldschmidt.
22. Calliope	" Nov. 16	Hind.	51. Virginia	" Oct. 4	Ferguson.
23. Thalia	" Dec. 15	Hind.	52. Nemausa	1858, Jan. 22	Laurent, Nimes (Fr.)
24. Themis	1853, Apr. 5	De Gasparis.	53. Europa	" Feb. 6	Goldschmidt.
25. Phocea	" Apr. 7	Chacornac, Marseille	54. Calypso	" Apr. 4	Luther.
26. Proserpine	" May 5	Luther.	55. Alexandra	" Sept. 10	Goldschmidt
27. Euterpe	" Nov. 8	Hind.	56. Pandora	" Sept. 10	Searle, Albany, N.Y.
28. Bellona	1854, Mar. 1	Luther.	57. Mnemosyne	1859, Sept. 22	Luther.
29. Amphitrite	" Mar. 1	Marth, London.	58. Concordia	1860, Mar. 24	Luther.

Name.	Date of Discovery.	Discoverer.
59. Olympia. . .	1860, Sept. 12	Chacornac
60. Echo	" Sept. 15	Ferguson.
61. Danäe.....	" Sept. 19	Goldschmidt.
62 Erato.....	" Sept. 14	Förster. Berlin.
63. Ausonia.....	1861, Feb. 10	De Gasparis.
64. Angelina....	" Mar. 4	Tempel, Marseille.
65. Maximiliana	" Mar. 8	Tempel.
66 Maia....	" Apr. 9	Tuttle, Cambridge.
67. Asia	" Apr. 17	Pogson, Madras.
68 Hesperia....	" Apr. 29	Schiaparelli, Milan.
69. Leto..	" Apr. 29	Luther.
70. Panopea .. .	" May 5	Goldschmidt.
71. Niobe.....	" Aug. 13	Luther.
72. Feronia. ...	1862. Feb. 12	Peters, Cl'nt'n, N.Y.
73. Clytie.....	" Apr. 7	Tuttle, U. S.
74. Galatea.....	" Aug. 29	Tempel.
75. Eurydice....	" Sept. 22	Peters.
76. Freya,.....	" Oct. 21	D'Arrest, C'p'nh'g'n
77. Frigga.....	" Nov. 12	Peters.
78. Diana.....	1863, Mar. 15	Luther.
79. Eurynome ..	" Sept. 19	Watson, Ann Arbor
80. Sappho	1864, May 3	Pogson, Madras.
81. Terpsichore.	" Sept. 30	Tempel.
82. Alcmene	" Nov. 27	Luther.
83. Beatrix.....	1865, Apr. 26	De Gasparis.
84. Clio.....	" Aug. 25	Luther.
85. Io.....	" Sept. 19	Peters.
86. Semele.....	1866, Jan. 6	Tietjen, Berlin.
87. Sylvia.....	" May 16	Pogson, Madras.
88. Thisbe.....	" June 15	Peters.
89. Julia.....	" Aug. 6	Stéphan, Marseille.
90. Antiope.....	" Oct. 1	Luther.
91. Ægina..... ..	" Nov. 4	Stéphan.
92. Undina.....	1867, July 7	Peters.
93. Minerva.....	" Aug. 24	Watson.
94. Aurora	" Sept. 26	Watson.
95. Arethusa....	" Nov. 23	Luther.
96. Ægle..... ..	1868, Feb. 17	Coggia, Marseille.
97. Clotho..... ..	" Feb. 17	Tempel.
98. Ianthe	" Apr. 18	Peters.
99. Dike.....	" May 29	Borello, Marseille.
100. Hecate.....	" July 11	Watson.
101. Helena.....	" Aug. 16	Watson.
102. Miriam.....	" Aug. 22	Peters.
103. Hera.....	" Sept. 7	Watson.
104. Clymene.....	" Sept 13	Watson.
105. Artemis.....	" Sept. 16	Watson.
106. Dione.....	" Oct. 10	Watson.
107. Camilla.....	" Nov. 17	Pogson, Madras.
108. Hecuba.....	1869, Apr. 2	Luther.
109. Felicitas.....	" Oct. 9	Peters.
110. Lydia..... ...	1870, Apr. 19	Borelly.
111. Ate.....	" Aug. 14	Peters.
112. Iphigenia. ..	" Sept. 19	Peters.
113. Amalthea....	1871, Mar. 12	Luther.
114. Cassandra...	" July 24	Peters.
115. Thyra.....	" Aug. 6	Watson.
116. Sirona	1871, Sept. 8	Peters.
117. Lomia	" Sept. 12	Borelly.
118. Peitho	1872, Mar. 15	Luther.
119. Althea	" Apr. 3	Watson.
120. Lachesis	" Apr. 10	Borelly.
121. Hermione...	" May 12	Watson.
122. Gerda.....	" July 31	Peters.
123. Brunhilda...	" July 31	Peters.
124. Alcestis	" Aug. 23	Peters.
125. Liberatrix..	" Sept. 11	Prosp. Henry, Paris.
126. Velleda.....	" Nov. 5	Paul Henry, Paris.
127. Johanna	" Nov. 5	Prosper Henry.
128. Nemesis	" Nov. 25	Watson.
129. Antigone....	1873, Feb. 5	Peters.
130. Electra	" Feb. 17	Peters.
131. Vala.....	" May 26	Peters.
132. Æthra.....	" June 13	Watson.
133. Cyrene	" Aug. 16	Watson.
134. Sophrosyne..	" Sept. 27	Luther.
135. Hertha.....	1874, Feb. 18	Peters.
136. Austria.....	" Mar. 18	Palisa, Pola.
137. Melibœa	" Apr. 21	Palisa.
138. Tolosa.....	" May 19	Perrotin, Toulouse.
139. Juewa	" Oct. 10	Watson, Peking.
140. Siwa	" Oct. 13	Palisa.
141. Lumen.....	1875, Jan. 13	Paul Henry.
142. Polana	" Jan. 28	Palisa.
143. Adria.....	" Feb. 23	Palisa.
144. Vibilia.....	" June 3	Peters.
145. Adeona.....	" June 3	Peters.
146. Lucina	" June 8	Borelly.
147. Protogeneia.	" July 11	Schulhof, Vienna.
148. Gallia.....	" Aug. 7	Prosper Henry.
149. Medusa.....	" Sept. 21	Perrotin.
150. Nuwa	" Oct. 18	Watson.
151. Abundantia.	" Nov. 1	Palisa.
152. Atala.....	" Nov. 2	Paul Henry.
153. Hilda.....	" Nov. 2	Palisa.
154. Bertha	" Nov. 4	Prosper Henry.
155. Scylla.....	" Nov. 8	Palisa.
156. Xanthippe ..	" Nov. 22	Palisa.
157. Dejanira	" Dec. 1	Borelly.
158. Coronis	1876, Jan. 4	Knorre, Berlin.
159. Æmilia.....	" Jan. 26	Paul Henry.
160. Una	" Feb. 21	Peters.
161. Athor.....	" Apr. 18	Watson.
162. Laurentia ...	" Apr. 21	Prosper Henry.
163. Erigone.....	" Apr. 26	Perrotin.
164. Eva	" July 12	Paul Henry.
165. Loreley	" Aug. 10	Peters.
166. Rhodope	" Aug. 17	Peters.
167. Urda	" Aug. 29	Peters.
168. Sibylla	" Sept. 28	Watson.
169. Zelia	" Sept. 28	Prosper Henry.
170. Maria	1877, Jan. 10	Perrotin.
171. Ophelia	" Jan. 13	Borelly.
172. Baucis.....	" Feb. 5	Borelly.

The following planetoids have been discovered since 1877, Feb. 5, when the 172d was found. The number amounted to 299, Jan. 1891 :

Name.	Date of Discovery.	Discoverer.
173.....	1877, Aug. 2	Borelly.
174.....	" Sept. 2	Watson.
175.....	" Oct. 1	Watson.
176 Idunna	" Oct. 14	Peters.
177.....	" Nov. 5	Paul Henry.
178.....	" Nov. 6	Palisa.
179.....	" Nov. 11	Watson.
180 Garumna	1878, Jan. 29	Perotin.
181 Eucharia.....	" Feb. 2	Cotteretot.
182 Elsbeth.....	" Feb. 7	Palisa.
183 Iseria.....	" Feb. 8	Palisa.
184 Deiopeia.....	" Feb. 28	Palisa.
185 Ennike.....	" Mar. 1	Peters.
186 Celuta.....	" Apr. 6	Prosper Henry.
187 Lamberta.....	" Apr. 11	Coggin.
188 Menippe.....	" June 18	Peters.
189 Phthia.....	" Sept. 9	Peters.
190 Esmene.....	1878, Sept. 22	Peters.
191 Kolga	" Sept. 30	Peters.
192 Mansikaa	1879, Feb. 17	Palisa.
193 Ambrosia	" Feb. 28	Coggin.

Name.	Date of Discovery.	Discoverer.
194 Proene	1879, Mar. 21	Peters.
195 Eurycleia	" Apr. 19	Palisa.
196 Philomela	" May 14	Peters.
197 Arete	" May 21	Palisa.
198 Ampella	" June 13	Borelly.
199 Byblis	" July 9	Peters.
200 Dynamene	" July 27	Peters.
201 Penelope	" Aug. 7	Palisa.
202 Chryseis	" Sept. 1	Peters.
203 Pompeia	" Sept. 25	Peters.
204 Callisto	" Oct. 8	Palisa.
205	" Oct. 13	Palisa.
206 Hersilia	" Oct. 13	Peters.
207	" Oct. 17	Palisa.
208	" Oct. 21	Palisa.
209 Dido	" Oct. 22	Peters.
210	" Nov. 12	Palisa.
211	" Dec. 10	Palisa.
212	1880, Feb. 6	Palisa.
213 Silaea	" Feb. 17	Peters.
214	" Mar. 1	Palisa.
215 Oenone	" Apr. 7	Knorre.
216	" Apr. 10	Palisa.
217	" Aug. 30	Coggin.
218	" Sept. 4	Palisa.
219	" Sept. 30	Palisa.
220	1881, Feb. 23	Palisa.
221 Eos	1882, Jan. 18	Palisa.
222 Lucia	" Feb. 9	Palisa.
223 Rosa	" Mar. 10	Palisa.
224 Oceana	" Mar. 30	Palisa.
225 Henrietta	" Apr. 19	Palisa.
226 Weringia	" July 19	Palisa.
227 Philosophia	" Aug. 12	Prosper Henry.
228 Agathe	" Aug. 19	Palisa.
229 Adelina	" Aug. 22	Palisa.
230 Athamantis	" Sept. 3	L. de Ball.
231 Vindobonda	" Sept. 10	Palisa.
232 Russia	1883, Jan. 31	Palisa.
233	" May 11	Borelly.
234 Barbara	" Aug. 12	Peters.
235 Carolina	" Nov. 28	Palisa.
236 Honoria	1884, Apr. 26	Palisa.
237 Coelestine	" June 27	Palisa.
238 Hypatia	" July 1	Knorre.
239	" Aug. 18	Palisa.
240 Vanadis	" Aug. 27	Borelly.
241 Germania	" Sept. 12	Luther.
242 Kriemhild	" Sept. 22	Palisa.
243	" Sept. 29	Palisa.
244	" Oct. 14	Palisa.
245	" Oct. 27	Palisa.
246	1885, Mar. 14	Luther.

PLANETS (Gr. *planētes*, "a wanderer") are those heavenly bodies (including the earth) which belong to our solar system, and revolve in elliptic orbits round the sun. They are often denominated *primary planets*, to distinguish them from their moons or satellites, which are called *secondary planets*. The name planet is of considerable antiquity, and was applied to these dependants of the sun to distinguish them from the myriads of luminous bodies which stud the sky, and which present to the naked eye no indication of change of place (see STARS). The planets at present known are, in the order of their distance from the sun, Mercury, Venus, the earth, Mars, the planetoids (q.v.), Jupiter, Saturn, Uranus, and Neptune. Six of these, Mercury, Venus, the earth (which was not, however, then reckoned a planet), Mars, Jupiter, and Saturn, were known to the ancients; Uranus was discovered by sir William Herschel (q.v.) in 1781; and Neptune, after having its position and elements determined theoretically by Leverrier and Adams, was discovered by M. Challis, and afterwards by Dr. Galle, in 1846. The planetoids, of which more than 180 are now known, have all been discovered during the present century. Five of the planets, the earth, Jupiter, Saturn, Uranus, and Neptune, are attended by one or more satellites; Uranus (generally), Neptune, almost the whole of the planetoids, and all the satellites except the moon, are invisible to the naked eye. The visible planets can be at once distinguished from the fixed stars by their clear steady light, while the latter have a sparkling or twinkling appearance. The comparative proximity of the planets may be proved by examining them through a telescope of moderate power, when they appear as round luminous disks, while the fixed stars exhibit no increase of magnitude. The planets, as observed from the earth, move some-

times from w. to e., sometimes from e. to w., and for some time remain stationary at the point where progression ends and retrogression commences. This irregularity in their movements was very puzzling to the ancient astronomers, who invented various hypotheses to account for it. See PTOLEMAIC SYSTEM and EPICYCLE. The system of Copernicus, by assuming the sun, and not the earth, as the center of the system, explained with admirable simplicity what seemed before a maze of confusion.

The planetary orbits differ considerably in their degrees of eccentricity, the planetoids, Mars, and Mercury being most, and the larger planets least eccentric. No two planets move exactly in the same plane, though, as a general rule, the planes of the larger planets most nearly coincide with that of the ecliptic. The latter are consequently always to be found within a small strip of the heavens extending on both sides of the ecliptic; while the others have a far wider range, Pallas, one of them, having the angular elevation of its orbit no less than 34° 42′ above the ecliptic. According to Kepler's laws (q.v.), the nearer a planet is to the sun the shorter is the time of its revolution. The arrangement of the planets in the solar system bears no known relation to their relative size or weight, for though Mercury, Venus, and the earth follow the same order in size and distance from the sun, yet Mars, which is further from the sun, is much less than either the earth or Venus, and the planetoids, which are still further off, are the least of all. Jupiter, which is next in order, is by far the largest, being about 1½ times as large as all the others together; and as we proceed further outwards, the planets become smaller and smaller, Saturn being less than Jupiter, Uranus than Saturn, and Neptune, than Uranus.

With reference to their distance from the sun, as compared with that of the earth, the planets are divided into *superior* and *inferior;* Mercury and Venus are consequently the only "inferior" planets, all the others being "superior." The inferior planets must always be on the same side of the earth as the sun is, and can never be above the horizon of any place (not in a very high latitude) at midnight; they are always invisible at their superior and inferior conjunctions, except when, at the latter, a *transit* (see SUN) takes place. The superior planets are likewise invisible at conjunction, but when in opposition they are seen with the greatest distinctness, being then due south at midnight. The time which elapses from one conjunction to its corresponding conjunction is called the *synodic period* of a planet, and in the case of the inferior planets must always be greater than the true period of revolution.

Mercury, the planet which is nearest the sun, is also, with the exception of the planetoids, the smallest (being only 3 times the size of the moon), and performs its revolution round the sun in the shortest time. Its greatest elongation is never more than 28° 45′, and consequently it is never above the horizon more than two hours after sunset, or the same time before sunrise; on this account, and from its small apparent size (5″ to 12″), it is seldom distinctly observable by the naked eye. It shines with a peculiarly vivid white or rose-colored light, and exhibits no spots.

Venus, the next in order of distance and period, is to us the most brilliant of all the planets. Its orbit is more nearly a circle than any of the others, and when at its inferior conjunction, it approaches nearer the earth that any other planet. Its apparent angular dimensions thence vary from 10″ at the superior, to 70″ at the inferior conjunction. Its greatest elongation varies from 45° to 47° 12′, and therefore it can never be above the horizon for much more than three hours after sunset, or the same time before sunrise. While moving from the inferior to the superior conjunction, Venus is a *morning star;* and during the other half of its synodic period, an *evening star.* When this planet is at an elongation of 40°, its brilliancy is greatest, far surpassing that of the other planets, and rendering a minute examination through the telescope impossible. At this period it sometimes becomes visible in the day-time, and after sunset is so bright as to throw a distinct shadow. Astronomers have repeatedly attempted to ascertain the nature and characteristics of its surface, but its brightness so dazzles the eyes as to render the correctness of their observations at best doubtful. From the changes in the position of dusky patches on its surface, which have been frequently noticed, it is concluded that it revolves on its axis, and that its equator is inclined to the plane of its orbit at an angle of 75°; but many astronomers (sir John Herschel included) profess to doubt these conclusions. Both Venus and Mercury necessarily exhibit phases like the moon.

The *Earth,* the next planet in order, will be found under its own name; it has a single satellite, the *moon* (q.v.).

Mars, the first of the superior planets, is much inferior in size to the two previous, its volume being about ⅐ of the earth's, and, after Mercury, its orbit is much more eccentric than those of the other planets. When it is nearest to the earth (i.e., in opposition), its apparent angular diameter is 30″; but when furthest from it (i.e., in conjunction), its diameter is not more than 4″. Mars is less known than the rest of the superior planets, owing to its not possessing a satellite, by the motions of which its attractive force (and hence its mass and density) could be estimated. It shines with a fiery red light, and is a brilliant object in the heavens at midnight when near opposition; when seen through the telescope its surface appears to be covered with irregular blotches, some of them of a reddish, others of a greenish color, while at each pole is a spot of dazzling white. The red spots are surmised to be land; the green, water; while the white spots at the poles are

with some reason supposed to be snow, since they decrease when most exposed to the sun, and increase under the contrary circumstances. The phases (q.v.) of Mars range between full, half, full (in conjunction, if visible), and half.

The Planetoids.—After Mars in order come the *planetoids* (q.v.), formerly but improperly called asteroids.

Jupiter, the next in order, is the largest of all the planets, its bulk being more than 1400 times that of the earth, though, from its small density, its mass is only 338 times more. After Venus it is the brightest of the planets and the largest in apparent size, its angular diameter varying from 30″ to 45″. When looked at through a telescope, it is seen to be considerably flattened at the poles, owing to its rapid revolution on its own axis; and its surface is crossed in a direction parallel to its equator by three or four distinct and strongly-marked belts, and a few others of a varying nature. Spots also appear and remain for some time on its surface, by means of which its revolution on its axis has been ascertained. This planet is attended by four satellites, which are easily observable through an ordinary telescope, and which have rendered immense service in the determination of longitudes at sea, and of the motion and velocity of light. The satellites, which were discovered by Galileo, were proved by sir William Herschel to revolve on their own axes in the same time that they revolve round their primary. The smallest is about the same size as our moon, the others are considerably larger.

Saturn, next in position, is about 735 times larger in volume, though only about 100 times greater in mass than the earth. Its apparent diameter when in opposition is 18″, and there is a considerable flattening toward the poles. Its surface is traversed by dusky belts much less distinctly marked than those of Jupiter, owing doubtless in great part to its inferior brightness; its general color is a dull white or yellowish, but the shaded portions, when seen distinctly, are of a glaucous color. The most remarkable peculiarity of Saturn is its ring, or series of concentric rings, each one parallel and in the same plane with the others and with the planet's equator; the rings are at present supposed to be three in number, the two outermost are bright like the planet itself, while the innermost is of a purplish color, and is only discernible through a powerful telescope. The rings are not always visible when Saturn is in the "opposite" half of its orbit, for when the plane of the rings is intermediate between that of the earth's orbit and of the ecliptic, their dark surface is turned toward us, and when the sun is in their plane only the narrow edge is illumined; in both of these cases the ring is invisible from the earth. Its plane being inclined at an angle of 28° to the ecliptic, we see the two surfaces of the ring alternately for periods of 15 years at a time; and at the middle of each period, the rings attain their maximum obliquity to the ecliptic, and are then best seen from the earth. It is hardly necessary to remark that at the end of each period they become invisible. Saturn has also no less than eight satellites, seven of which revolve round it in orbits little removed from the plane of the ring, while the eighth, which is the second in size, is considerably inclined to it. Two of the satellites were discovered by Herschel in 1787 and 1789, four by Cassini in 1672–84, one by Huyghens in 1655, one by Mr. Lassell in England and Prof. Bond in America in 1848. The satellites are all situated outside of the ring, and the largest of them is nearly equal to the planet Mars in size.

Uranus, the next planet in position, was discovered accidentally by the elder Herschel on Mar. 13, 1781, and was named "the Georgium Sidus" and "Herschel," but these names soon fell into disuse. It is about 96 (some astronomers say 82) times greater than the earth in volume, and 20 (according to others, 15) times in mass; but though so large, its distance is so much greater in proportion that astronomers have been unable to gain much information concerning it. No spots or belts have hitherto been discovered on its surface, and consequently its time of rotation and the position of its axis are unknown. It is attended by a number of satellites, but so minute do these bodies appear, that astronomers hitherto have been unable to agree as to their exact number; sir William Herschel reckoned six, while other astronomers believe in the existence of four, five, and eight respectively. That there are at least four is without doubt.

Neptune is the next and outermost member of the solar system, and, at a distance of nearly 3,000 millions of miles from the center of the system, slowly performs its revolution round the sun, accomplishing the complete circuit in about 165 solar years. It is about 84 times larger than the earth, but from its extreme remoteness is of almost inappreciable magnitude when seen through an ordinary telescope. It was the disturbance in the motion of Uranus caused by the attractive force of this planet which led Leverrier and Adams to a calculation of its size and position, on the supposition of its existence; and the directions which were given by the former to Dr. Galle of Berlin, specifying its exact position in the heavens, led that astronomer to its discovery on Sept. 23, 1846. Mr. Lassell of Liverpool has discovered that Neptune is attended by one satellite. The satellites of Uranus and Neptune differ from the other planets, primary and secondary, in the direction of their motion, which is from e. to w., and in the case of the former, in planes nearly perpendicular to the ecliptic. Both Uranus and Neptune were observed long before the times of Herschel and Leverrier, but they were always supposed to be stars. Uranus is known to have been observed by Flamsteed between 1690 and 1715, and Neptune by Lalande in 1795.

In astronomical tables, almanacs, etc., the planets are for convenience denoted by

symbols instead of their names, as follows: Mercury, ☿; Venus, ♀; earth, ♁; Mars, ♂; the planetoids, in the order of their discovery, ①, ②, ③, etc.; Jupiter, ♃; Saturn, ♄ or ♄; Uranus, ♅: Neptune, ♆; the sun, ☉; the moon, ☾.

For a TABLE of the periods, distances, size, density, etc., of the planets, see SOLAR SYSTEM. See illus., SOLAR SYSTEM, vol. XIV.

PLAN OF CAMPAIGN is a term used to designate a particular form of organization and action among Irish tenantry for the purpose of resisting the collection of what they deem oppressive rents. The project was first formulated in the fall of 1886, and was set forth in detail in a supplement to *United Ireland*, issued Nov. 20. It was claimed by the Irish agitators that the agricultural situation at that time made impossible the payment of existing rents, even of those judicially fixed under the Land Act of 1881. Landlords who refused to regard the demands for reductions and who proceeded to eviction were to be met by united action of the tenants. The fundamental principle of the Plan of Campaign is combination of the tenantry by estates, as distinct from organization by localities such as characterized the National League. The general line of action is as follows: The tenantry of a given estate meet and determine what abatement of rent they will demand. Each pledges himself (1) to abide by the decision of the majority; (2) to communicate with the landlord only in the presence of the whole body of tenantry; and (3) to accept no individual settlement. A committee is then appointed whose names are kept secret. On gale-day the tenants go in a body to the landlord or his agent, and each tenders the reduced rent agreed upon. If it is not accepted, it is turned over to the committee, to be used at their discretion in bringing the landlord to terms. The committee generally commits the possession of the money to some trustworthy person whose name is known only to them. "Thus, practically," the original project says, "a half-year's rent of the estate is put together to fight the landlord with." As to the employment of the fund, no general rules are laid down, except (1) that it must be used to support evicted tenants, and (2) that it must *not* be spent for law costs. The National League was connected with the Plan of Campaign as guarantor of any estate fund whose trustee proved dishonest, or which should be exhausted before the object of the tenantry was attained. Explicit instructions were furnished by the authors of the plan as to ways and means of obstructing the exercise of his legal rights against the tenants by the landlord, and urgent pleas were made for united action at any cost against dispossession. "No landlord should get one penny rent anywhere or on any part of his estate, wherever situated, so long as he has one tenant unjustly evicted." The Plan of Campaign was put into application on many estates in the fall of 1886 and continued for several years to be the most conspicuous instrument of agitation. Early in 1887 it was declared by the courts to be illegal, and in 1888 the Pope issued a rescript condemning it. Its advocacy brought several leaders of the Nationalist party into prison, notably John Dillon and William O'Brien. According to a statement of the latter, made in January, 1891, the Plan of Campaign had been enforced on 110 estates, on 85 of which it had been successful in bringing reduced rents. Over 20 contests still remained undecided, of which the most celebrated was that of Mr. Smith-Barry's estate, which embraced much of the business part of the town of Tipperary. See IRISH LAND LAWS.

PLANT, a living organic being, destitute of any indication of mind or feeling, and sometimes defined as essentially differing from an animal in the want of voluntary motion. Plants are the organisms which form the *vegetable kingdom;* the science which treats of them is botany (q.v.). Plants of higher organization can never be mistaken for animals, nor animals of higher organization for plants. But there is no regular ascending and descending scale of organisms, from the highest animal to the lowest plant; instead we find a widely extended base from which the ascent seems to begin at once in both the organic kingdoms, with many ramifications in each; and in the case of the lowest groups of either kingdom, it is sometimes difficult to discern the difference between plants and animals. The difficulty may be owing to our ignorance and incapacity of proper observation.

Something which resembles the voluntary motion of animals is to be seen in some plants, in various phenomena of irritability (q.v.); and there is even locomotion in the vegetable kingdom wonderfully simulating voluntary locomotion, a provision of nature for the diffusion of some of the lower vegetable organisms; the *gonidia* (q.v.) of algæ and the *spermatozoïdia* of some other cryptogamous orders moving in a surrounding fluid by means of cilia, so that they have often been mistaken for animalcules. But no motion which can really be deemed voluntary takes place in the vegetable kingdom; and no animal, certainly to be pronounced such, fails to exhibit it—even when there is no power whatever of locomotion—in the prehension of food, or for some of the purposes of life.

The general laws which govern life prevail in plants as in animals. There are organs of nutrition and organs of reproduction; the whole being made up of organs, and every organ destined to maintain the existence either of the individual or of the race. But there is nothing in plants corresponding to the mouth, stomach, and alimentary canal of animals. Nutrition takes place in a different manner; assimilation being effected by a process very unlike that of digestion in animals. There are, however, animals destitute of a mouth, stomach, and alimentary canal; so that the distinction between plants and animals cannot be stated so absolutely in this respect as in respect to voluntary motion;

and as there are many plants which have no roots, nutrition by means of roots, although peculiar to the vegetable kingdom, is not its distinguishing characteristic. The nutriment of plants is derived either by their roots from the soil (see ROOT), or through the integuments of their other parts from the air or water in which they live; and all their nutriment is either liquid or gaseous, being taken up in the former case by endosmose (q.v.), and in the latter case through *stomata* (q.v.). Many plants, and among them the greater number of phanerogamous plants, owe their nourishment both to the soil and to the atmosphere, their roots deriving it from the former, and the leaves (q.v.) of plants that have leaves being the principal organs by which they derive it from the latter. When leaves are wanting, the integument of the parts exposed to the air performs the functions ordinarily assigned to them. Solid matter cannot be appropriated by plants until it has been dissolved in water, or decomposed. See MANURE and SOIL.—The nutriment appropriated by the plant is not assimilated until it has undergone chemical changes, which sometimes take place entirely within the very cell through the integument of which it has entered, some of the lowest kinds of plants consisting altogether only of a single cell, but which, in other plants of higher and more complex organization, depend upon a circulation of the sap (q.v.), and a very various action of many different organs, each formed of a multitude of cells. These processes are still very imperfectly understood. By them, not only is the plant nourished, but vegetable products of every kind are elaborated, in which, throughout the wide domains of the vegetable kingdom, there is such wonderful variety, and often great diversity in different parts of the same plant.

Whatever the source from which plants derive their nutriment, no organic substance is appropriated by them; but in order to their use, it must first undergo decomposition. Their food consists wholly of inorganic matter, and the value of organic substances as manures depends not only on the abundance which they contain of the proper elements, but of the readiness with which they undergo decomposition so as to present these elements in the most suitable form; which is not, however, as elements uncombined, but in various combinations with each other. Thus carbon and oxygen enter plants together in the form of carbonic acid, oxygen and hydrogen together in the form of water, hydrogen and nitrogen in the form of ammonia. Carbonic acid absorbed by the leaves from the air is decomposed within the plant, under the influence of light, and particularly of the direct rays of the sun, and its carbon enters into new combinations to form vegetable substances, whilst its oxygen is exhaled again into the atmosphere, which is thus maintained in a state fit for the support both of vegetable and animal life by the opposite and balanced action of animals and plants. Of the elements which enter into the composition of vegetable substances, carbon is the most abundant; and, along with it, oxygen, hydrogen, and nitrogen constitute the chief part of every plant. Other elements, both metallic and non-metallic, are found in comparatively small quantity, although some of them are very generally present in plants, as calcium, potassium, sodium, sulphur, phosphorus, silicon, iron, aluminium, magnesium, chlorine, and iodine. Among the elements found in plants are also to be enumerated bromine, manganese, and copper, which occur only in minute quantities, and copper very rarely.

There is no circulation in plants like that of the blood in animals, nor any organ at all analogous to a heart; although there is a constant motion or circulation of their juices, both throughout the whole organism and within individual cells. And although the term *respiration* has been often employed with reference to plants, and particularly to leaves, yet there is not only no action analogous to that of lungs, but no oxygenation of the juices by their being brought into contact with the air; carbonic acid and ammonia—not oxygen—being imbibed from it for nutrition. And there is nothing in the vegetable kingdom having the slightest resemblance to a brain or a nervous system. In the possession of sexual organs, however, there is a wonderful agreement, where it might least have been expected, between plants—or at least all phanerogamous plants—and animals. As to this and other important points concerning the life of plants, see VEGETABLE PHYSIOLOGY. See also the article FLOWER, and those on the different organs of which the flower is made up; the articles FRUIT, SEED, SPORE; CELLS, CELLULAR TISSUE, VASCULAR TISSUE; METAMORPHOSIS OF ORGANS; LEAVES, STEM, etc. The great divisions of the vegetable kingdom are noticed in the article BOTANY, in connection with the subject of classification, and in separate articles. The GEOGRAPHICAL DISTRIBUTION OF PLANTS, and the DISEASES OF PLANTS, are noticed under these heads.

Besides the relations of the animal and vegetable kingdoms already noticed in this article, in their joint and balanced action, keeping the constitution of the atmosphere such as is fit both for animal and vegetable life, reference may be here made, in conclusion, to similar relations subsisting in plants and animals as to temperature and as to their mutually providing food for one another. "It would almost seem as if plants possessed a power of producing cold analogous to that exhibited by animals in producing heat, and of this beneficent arrangement man enjoys the benefit in the luxurious coolness of the fruit which nature lavishes on the tropics" (sir J. E. Tennent). Flowers indeed produce heat; but the juices of plants are colder than the soil or surrounding atmosphere during the time of active vegetation: and the coolness of groves is owing not only to shade, but to the transpiration of moisture by the innumerable leaves.—Inorganic substances are appropriated by plants, as food, and converted by a "high and mysterious"

chemistry into organic substances of many kinds, many of them suitable food for animals, which feed on organic substances alone. But the excrements of animals again furnish food for plants; and when animals die, their bodies undergo a series of changes by decomposition, which terminate in the production of the substances most suitable for the nourishment of plants. There is, moreover, not only this conversion of the same matter into animal and vegetable substances alternately; but there is also a continual transformation of matter which has remained inorganic throughout long geologic periods into organic substances, and in this some of the lowest kinds of plants are particularly employed, as lichens, which decompose and feed upon the very rocks on which they grow; whilst, on the other hand, the fossil remains of remote periods, and all the products of decomposition, exhibit matter which once formed part of living organisms returned to an inorganic state.

PLANTAGENET, the surname of the French family of Anjou, which, in 1154, succeeded to the throne of England on the extinction of the Norman dynasty in the male line, and reigned till 1485, when it was supplanted by the family of TUDOR (q.v.). The name Plantagenet belonged originally to the house of Anjou, and is said by antiquarians to have been derived from the circumstance of the first count of this house having caused himself to be scourged with branches of broom (*planta-genista*), as a penance for some crime he had committed. On the extinction of the male line of the Norman dynasty in the person of Henry I., the crown of England was claimed by Stephen, count of Blois, the son of Henry's sister Adela, or Adeliza, and by Henry's own daughter Matilda ("the empress Maud"), then the wife of Geoffrey Plantagenet, count of Anjou, for her son Henry Plantagenet. Stephen, by favor of the nobles, was the successful competitor, on the condition that Henry should succeed him; and accordingly on Stephen's death, in 1154, the son of Geoffrey Plantagenet ascended the throne of England as Henry II. His sons, Richard I. and John, succeeded him, and the descendants of the latter in the direct male line—viz., Henry III., Edward I., Edward II., Edward III., and (Edward III.'s eldest son, the Black Prince, having died before his father, leaving an only son, who as) Richard II.—succeeded without interruption. The eldest male line now became extinct, and it was necessary to choose the rightful heir to the throne from among the descendants of Edward III.'s other sons. His second son had died without heirs, but Lionel, duke of Clarence; John of Gaunt, duke of Lancaster; and Edmund Langley, duke of York, his third, fourth, and fifth sons respectively, were still represented by legitimate issue. Of these, Edmund Mortimer, earl of March, and Anne Mortimer, the wife of Richard, earl of Cambridge (who was the eldest son and heir of Edmund Langley, duke of York), the lineal descendants of Lionel of Clarence, possessed the prior claim to the throne; but Edmund was put in prison by Henry IV., the eldest son of John of Gaunt, duke of Lancaster, who usurped the crown in 1399, and transmitted it to his lineal descendants Henry V. and Henry VI. By this time Edmund Mortimer had died without heirs, and the descendants of the marriage of his sister Anne (the heiress of Clarence) with Richard, earl of Cambridge (the heir of York), uniting the claims of the *third* and *fifth* sons, had, through their maternal ancestress, a superior claim to the throne over Henry VI., the Lancastrian monarch, who only represented the *fourth* son of Edward III. Richard, duke of York, the son of Richard of Cambridge, and Anne Mortimer, attempted to obtain the crown, but he was taken and executed, leaving to his sons the task of avenging his death, and asserting the claims of the combined house of York and Clarence to the throne, in which they were ably assisted by Richard Neville, earl of Warwick ("the king-maker"). The result was a long and desolating civil war (1455–85) between the partisans of York and Lancaster, which is known in history as the "Wars of the Roses" (the Lancastrians having chosen for their emblem a *red* and the Yorkists a *white* rose), in which more than 100,000 persons perished, and many noble families were either extirpated on the field and the scaffold, or completely ruined. During this dreadful contest, in which the Yorkists generally had the advantage, Edward IV. (the eldest son of the duke of York who had been executed), his son Edward V., and his brother Richard III. (q.v.) successively swayed the scepter. But Richard's cruel and tyrannical government added new vigor to the reviving Lancastrians, and Henry Tudor (see HENRY VII.), the representative of their claims, defeated the Yorkist tyrant on the field of Bosworth; and then, by his marriage with Elizabeth, the eldest daughter of Edward IV., and the representative of the Yorkist claims, reunited in his family the conflicting pretensions to the throne, which he transmitted in peace to his descendants. See TUDOR; and, for the events of this contest, see ROSES, WARS OF THE.

PLANTAIN, *Musa paradisaica,* a most important food-plant of tropical countries, and one of the largest of herbaceous plants, belongs to the natural order *musaceæ* (q.v.), and is a native of the East Indies, where numberless varieties of it have been cultivated for thousands of years. It is now diffused over all the tropical and subtropical regions of the globe. It must have been carried to America soon after or during the days of Columbus, for its fruit was a principal article of food there in the first half of the 16th c.; but there is nothing to support the conjecture of Humboldt that there may be different species cultivated under the name of plantain, and some of them natives of America. The plantain is now, however, cultivated to the furthest depths of the primeval American forests, accompanies the Indians in their frequent changes of residence, forms the

wealth of many occupiers of land in the vicinity of great towns, where large plantations of it are made, and is a true staff of life to the population of all colors and classes in tropical countries. In many regions it is the principal article of food.

In the genus *musa* there arise from the midst of the leaves—or apparently from the top of the stem, the sheathing bases of the leaves forming a tree-like false stem—stalks which bear great spikes of flowers, each inclosed in a large bract or spathe; the flowers, and afterwards the fruit, are arranged in clusters or almost in whorls on the stalk; the flowers have a perianth of six segments, five of which cohere as a tube slit at the back, and the sixth is small and concave; there are six stamens, one or more of them imperfect; the germen is inferior, 3-celled, with two rows of ovules in each cell; the fruit is fleshy, and has many seeds imbedded in its pulp. The name *musa* is from the Arabic *moz*, a plantain; the plantain seems to be described by Pliny under the name *pala*, a name probably derived from an eastern root, from which also comes the name *plantain*. The specific name *paradisaica* alludes either to a fancy that the plantain was the forbidden fruit of Eden, or to a legend that the aprons which our first parents made for themselves were of plantain leaves. See illus., TREES, ETC., vol. XIV.

The stem of the plantain is usually 15 or 20 ft. high, although there are varieties having a stem of only 6 feet. The leaves are very large, the blade being sometimes 10 ft. long and three ft. broad, undivided, of a beautiful shining green; the midrib strong and fleshy. The fruit is oblong, varying from its usual long shape to an almost spherical one, obscurely angular, 8 in. to a foot long in the varieties commonly known by the name plantain, of which the fruit is usually cooked or prepared in some way in order to be eaten, and very often forms a substitute for bread; whilst the smaller fruited varieties, of which the fruit is eaten raw, are generally known by the name banana (q.v.); these names, however, being somewhat variously used.

The plantain is generally propagated by suckers; and a sucker attains maturity in about eight months or a year after being planted. The stem is cut down after fruiting, but the plantation does not require renewal for 15 or 20 years. Plantains ought to be at least 10 ft. apart in plantations of them, or 6 ft. in single rows around fields or gardens. The plantain has been sometimes cultivated with success in hot-houses.

With the exception of two or three palms, it would not be easy to name, in the whole vegetable kingdom, any plant which is applied to a greater number of uses than the plantain. The fruit is sometimes eaten raw, although more generally—except that of the banana—boiled or roasted, and variously prepared. It is both farinaceous and saccharine. In most of the varieties it has a sweetish taste, in some it is mealy, and in some it is sub-acid or austere. It is as much used before being perfectly ripe as when it is so. In the West Indies the plantain boiled and beaten in a mortar is a common food of the negroes. Plantains baked in their skins, or fried in slices with butter and powdered over with sugar, are favorite dishes in some tropical countries. They are preserved by drying in the sun or in ovens, and pressed into masses, in which state they keep for years, and furnish a wholesome article of food. The unripe fruit, peeled, sliced, dried, and powdered, is called *P. meal*, and in Guiana *conquin-tay;* it is whitish with dark-red specks, a fragrance like orris-root, and a taste like wheat-flour; and is made into excellent and nourishing dishes. A good and wholesome starch is obtained from the plantain by rasping and washing.—A decoction of the fruit is a common beverage, and a kind of wine is obtained from it by fermentation.—The top of the stalk is a good boiled vegetable.—The leaves are much used for packing, and many other purposes; the fiber of their stalks is used for textile purposes and for cordage, and it is probable that it might be used for paper-making; but hitherto the leaves and stems of plantains have been generally burned or left to rot.

The name plantain is frequently extended to the whole genus *musa*. Wild species, with austere fruit, are found in many parts of the east. One ascends the Himalayas to an elevation of 6,500 feet. A species found in the South sea islands (*M. troglodytarum*) is remarkable for bearing its clusters of fruit erect, not pendent like the other species. Its fruit is eatable, as is that of *M. Cavendishii* and of *M. chinensis*, species or varieties smaller than the common plantain.—The *musa*, which is extensively cultivated in the Philippine islands for its fiber, *abaca* or *Manilla hemp*, is very similar to the common plantain, but has a green, hard, and austere fruit. It is generally cut when about a year and a half old, before flowering. The outer layers of the stem yield the coarsest fiber; that of the inner is so fine that a garment made of it may be inclosed in the hollow of the hand.—The young stems of *M. ensete*, the ENSETE of Abyssinia, are used in that country as a boiled esculent.

PLANTAIN-EATER, *Musophaga*, a genus of birds of the family *musophagidæ*, to the whole of which the same English name is often extended. The *musophagidæ* are tropical birds, African and South American, of the order *insessores*, and tribe *conirostres*, allied to finches, but many of them large, and more like gallinaceous birds than finches. They are birds of beautiful plumage. They have strong thick bills, more or less curved on the top, the cutting edges jagged or finely serrated, so as to render them very efficient instruments for cutting soft vegetable substances, on which they feed, as the plantain and other fruits, and for dividing the succulent stems of plants, which they cut off close to the ground. They live much among the boughs of trees, and are active and wary birds. The true plantain-eaters (*musophaga*) have the base of the bill extending upon the forehead; the TOURACOS (*corythaix*) have a smaller bill, and the head crested.

PLANTATION, a term sometimes applied to places where timber trees have been planted. In that sense, as a general rule, whoever is the owner of the soil, is entitled to the trees which are planted in such soil. When land is let by lease to a tenant, the tenant does not become the owner of the trees, and cannot cut them down. But he is in England and Ireland entitled to reasonable estovers; that is, to cut sufficient wood to repair or build the houses, or make implements of husbandry. The common law of England was very defective in protecting plantations, for it was held that, as the trees were part of the realty, or soil, and nobody could steal the soil, hence nobody could be punished for larceny of trees. But this defect was cured by statute. Whoever cuts, breaks, roots up, or otherwise destroys or damages, with intent to steal, the whole or any part of a tree, sapling, or shrub, if the damage is of the amount of one shilling, may be convicted summarily, before justices of the peace, and fined £5; for a second offense, he may be committed to the house of correction for 12 months or less; and for a third offense, he is guilty of felony, and may be punished as for larceny. So, whoever steals or damages a live fence, may be fined by justices a sum of £5; and for a second offense, may be committed to the house of correction for 12 months. Moreover, if any person is found in possession of a piece of a tree or live fence, and do not give a proper account of his coming into lawful possession of the same, he may be fined £2.—In Scotland, various acts of the Scotch parliament were directed against offenses of damaging trees, which are punishable as malicious mischief; the penalty being £10 Scots for each tree less than 10 years old, and £20 Scots for each older tree. Tenants may also be fined for such offenses. In case of injuries to fences, old Scotch statutes also provide a punishment.

PLANTATION AND PLANTING OF TREES. See ARBORICULTURE.

PLANT CUTTER, *Phytoma rara*, a conirostral bird nearly related to the finches. In the single genus *phytoma* the bill is of the conirostral type, short, strong, conical, with lateral margins finely serrated. The intestine is short, an unusual condition in vegetable-eating birds. They live in pairs or in small flocks and commit depredations in orchards by cutting off plants, buds, and fruits. They also catch insects. The best-known species is *phytotoma rara*, of Chili, of the size of the common thrush; back brown, each feather having a lighter edge. The top of the head is of a reddish-brown color; breast a dull reddish-white, rather more deeply colored on the belly and thighs. The wings are dark brown, the primaries having a white bar, the wing coverts also edged with white. The tail is brownish-red with a terminal dark brown bar. It has a short low flight, and a disagreeable rough note.

PLANTIGRA'DA, in Cuvier's zoological system, a tribe of *carnivora* (q.v.), characterized by placing the whole sole of the foot on the ground in walking. The sole is generally destitute of hair. Both fore and hind feet are five-toed in all the plantigrada. The plantigrada are generally more or less nocturnal in their mode of life, and their movements are slower and their gait more clumsy than those of the *digitigrada*. They are also, in general, less carnivorous; many of them feed in part or occasionally on vegetable food. The conformation of their limbs and feet gives them a power of standing erect on their hind-feet, which none of the *digitigrada* naturally possess, and of which advantage is taken in tame bears for the amusement of spectators.

PLANTIN, CHRISTOPHE, an eminent printer, was b. at St. Avertin, near Tours, in 1514, and set up a printing-establishment at Antwerp in 1550, which soon became the greatest and most celebrated of the time. He had often 20 presses or more in active operation. Guicciardini mentions his printing-establishment as the finest ornament of the city of Antwerp, and as one of the wonders of Europe, and the learned agreed in regarding him as the first printer of his time, although he was the contemporary of Aldus and Estienne (Stephens); but this is true only as regards the number of works which issued from his establishment, and the beauty of their typography; for the services which the others have rendered to classic literature are far beyond those of Plantin. Plantin was nevertheless himself a man of varied, though probably not very profound learning. He superintended the publication of works in several languages, and was extremely careful of their accuracy, employing able and learned correctors of the press, whom he remunerated liberally, and publicly offering rewards for the discovery of errors. The most noted of all his publications is the *Biblia Polyglotta* (8 vols. 1569–72), which was printed under the personal superintendence of Arias Montanus, the court chaplain of Philip II. of Spain, and towards which Philip gave 6,000 ducats for the purchase of paper. But the oldest book known to have proceeded from the press of Plantin is the *Institution d'une Fille de Noble Maison, traduite de Langue Toscane en François*, by Jean Beller (Ant. 1555). Plantin died at Antwerp in 1589. He had set up printing-establishments in Leyden and Paris, and these, with that in Antwerp, were carried on by the husbands of his three daughters.

PLANT LOUSE. See APHIS.

PLANTS, in point of law, when put in a garden or other ground let to a tenant, belong to the landlord, and not to the tenant, for they become part of the soil. Hence, a tenant cannot dig them up and remove them at the termination of his lease. This right of the landlord, however, is seldom enforced with much strictness, partly because the tenant

may alter and remove the plants at discretion during his lease, and thus can evade the rule of law. In the case of nursery-grounds, however, the above rule does not apply, as between landlord and tenant, for the plants are considered the stock-in-trade of the nurseryman, who puts them in the ground, not with a view to let them grow permanently, but as a convenient mode of keeping them for sale. Hence, at the termination of his lease, the tenant can remove them all.

PLANU'DES, Maximus. See Anthology.

PLAQUEMINES, a parish in s.e. Louisiana, on the gulf of Mexico, drained by the Mississippi; about 930 sq.m.; pop. '90, 12,541, inclu. colored. The surface is regular and low, including part of the delta of the Mississippi. The soil is fertile. The principal productions are molasses, sugar, and rice. The county produces the most rice of any in the state. Co. seat, Point à la Hache.

PLASEN'CIA, an ancient and much-decayed, but most picturesque t. of Spain, in the province of, and 43 m. n.n.e. of Caceres, stands on a steep hill, with beautiful and fertile valleys extending on the n.w. and s.e. sides. It is almost wholly girdled by the clear waters of the Jerte; and the surrounding scenery, embracing city, castle, river, rock, and mountain, and overarched by a sunny and unclouded sky, is remarkably beautiful. The city contains the picturesque remains of an ancient castle, and is surrounded by crumbling walls, surmounted by 68 towers, and pierced by 6 gates. Water is brought to the town by an aqueduct of 80 arches. There are 7 Gothic churches, an episcopal and several other palaces, and the cathedral, an ornate Gothic edifice, begun in 1498, and some portions of which are still unfinished, while others have been altered and disfigured. The cathedral contains many noble tombs, with effigies. Plasencia, once a flourishing and important city, was founded in 1190. It now carries on some minor manufactures of cotton, woolen, and hemp fabrics, and of hats and leather. Pop., 8000.

PLASMA, a silicious mineral, a variety of quartz or chalcedony, of a dark green color, black when unpolished and seen by reflected light, but very translucent when held between the eye and the light. It is very nearly allied to heliotrope or bloodstone, but has no red spots, is more translucent, and is not susceptible of so brilliant a polish. It is never found crystallized. It is a rare mineral, and the finest specimens are brought from India and China. It was highly prized by the ancient Romans, who wrought it into ornaments of various kinds; and very fine engraved specimens have been found among the ruins of ancient Rome. The ancients are said to have obtained their plasma from Mount Olympus, in Asia Minor. The name plasma is supposed to be identical with the Greek *prason,* a leek, the *r* having passed into *l.*

PLAS'SEY, a small t. of British India, in the presidency and province of Bengal, and in the district of Nuddea, 85 m. n. from Calcutta, on the left bank of the Bhagirathi, a river which derives its waters from the Ganges, and pours them into the Hooghly, or rather may be said to become the Hooghly. Plassey is celebrated in the history of India for the great victory gained by Clive (q.v.) over Suraja Dowlah, subahdar of Bengal, June 23, 1757, a victory the immediate effect of which was to transfer the subahdarship to Meer Jaffier, but which really laid the foundation of British supremacy in India. The British force at the battle of Plassey consisted of not much more than 3,000 men; and the only British troops were about 650 foot and 150 artillerymen, the remainder being sepoys. The subahdar's force consisted of 15,000 cavalry and 35,000 infantry, with 40 or 50 French artillerymen, 50 large cannon, and 4 pieces of light artillery. On the evening before the battle, Clive held a council of war, at which it was resolved to decline battle, on account of inferiority of force; but Clive himself afterwards adopting a different resolution, crossed the river, and won a most brilliant victory.

PLASTERING, the art of covering walls, partitions, ceilings, etc., with a composition of lime mixed with sand and hair. It is usually done in three coats. The first coat is the solid foundation on which the rest is placed; it is therefore of a good thickness, and is hatched or crossed with lines, so as to give a bond for the next coat. The first coat is allowed to dry thoroughly; then the second coat is floated over the first, and rubbed well in with a flat board, about 12 in. sq., so as to bring it all to a fair and equal surface (in Scotland this is called the "straightening"); and before the second coat has thoroughly dried, the third or finishing coat is applied in finer materials, and in a more liquid state. In the case of ceiling cornices, moldings, etc., plaster of Paris or stucco is generally used. This sets or hardens more rapidly than lime, and has a finer and whiter surface. Ornaments (called enrichments) are generally composed of plaster of Paris, and cast in molds. They are then set in their places after the cornice has been made, or *run.*

PLASTER OF PARIS. See Gypsum.

PLASTERS are a class of medicinal agents which are employed externally with various objects. They are solid and tenacious compounds, adhesive at ordinary temperature of the body, and owing their consistency—1, To the chemical combination of oxide of lead, with one or more fatty acids; or 2, to a due admixture of wax, or fat, and resin; or 3, to the chemical action of the component parts of the plaster on each other. Strictly speaking, the term *plaster* should be restricted to the first class of compounds; viz., to combination of oxide of lead with fatty acids. In the regular Pharmacopœia, there are directions for making 12 plasters, viz., ammoniac and mercury plaster, belladonna

plaster, cantharides plaster, chalybeate plaster, galbanum plaster, litharge (or lead) plaster, mercurial plaster, opium plaster, pitch plaster, resin plaster, soap plaster, and warm plaster. The litharge (or lead) plaster, directly or indirectly, enters into the composition of all the twelve officinal plasters, excepting those of ammoniac and mercury, cantharides, and pitch. *Lead plaster*, which is usually sold under the name of *diachylon*, in combination with resin, constitutes the ordinary *adhesive plaster*. The best plaster of this kind for strapping is composed of a mixture of six drams of resin with a pound of lead plaster. The *cantharides plaster* and the *ammoniac and mercury plaster*, are examples of the second and third varieties.

Plasters are generally kept in rolls; and when they are to be used, they are melted at a temperature of not more than 212°, and spread on soft leather. They are employed to answer two distinct indications, namely, to act *mechanically*, as by affording artificial support to weak muscular structures, by preventing threatened or tedious excoriations, by protecting parts already excoriated from the action of the air, etc.; and to act *medicinally* as stimulant, discutient, alterative, anodyne, etc.

PLA'TA, La. See Argentine Republic.

PLATA, Rio de la, a wide estuary of South America, between Uruguay on the n. and the Argentine Republic on the s., forms the mouth of the Paraná (q. v.) and the Uruguay (q. v.). It is 50 m. long, 29 m. broad at Buenos Ayres, and 140 m. broad at its mouth, between Maldonado and cape San Antonio. At its mouth it is, on an average, only about 10 fathoms deep; at Montevideo it is only 3 fathoms; and at Buenos Ayres about 16 ft. deep. Some conception of the vast volume of water which this estuary carries to the Atlantic may be had when it is remembered that with its affluents it drains an area of 1,250,000 sq. miles. The strong and irregular currents, and the sudden tempests of the La Plata, render its navigation extremely dangerous. It is estimated that through this estuary about one-fourth of the produce of South America is brought to market. For the navigation of its affluents, see Paraguay, Parana, and Uruguay.

PLATÆ'A, or Platææ, a city in the western part of Beotia, on the borders of Attica, and at the foot of Mount Cithæron. It was about 6½ m. from Thebes. In 480 B.C., it was destroyed by the Persians because the inhabitants had taken part with Athens in the battle of Marathon; but in the following year, it was the scene of the glorious victory won by the Lacedæmonian Greeks, under Pausanias and Aristides, over the Persian hordes commanded by Mardonius—a victory that finally delivered Greece from the threatened yoke of the invader. In the third year of the Peloponnesian war (429 B.C.), it was attacked by a Theban-Lacedæmonian force—for the Platæans were firm friends of Athens—and heroically defended itself for more than two years, until it was starved into surrender. The little garrison of about 200 men were put to the sword, and the city was razed to the ground. Such of the Platæans as escaped were hospitably received at Athens. By the treaty of Antalcidas (387 B.C.), their children were allowed to go back again, and rebuild their city, after an exile of 40 years; but they were again driven out by their implacable enemies, the Thebans; and half a century elapsed before the victory of Philip of Macedon at Chæroneia enabled the Platæans to finally return to their homes. After this, the city remained inhabited, probably till the latest days of the empire. It is mentioned in the 6th C. A.D. Some ruins of Platæa are still visible near the village of *Kokhla*.

PLATA'LEA. See Spoonbill.

PLAT-BAND, in architecture, a flat fascia or band, with less projection than breadth.

PLATE, in heraldry, a roundel argent. It is represented flat, and in the heraldry of Scotland is known as a *bezant argent*. See Heraldry.

PLATE-MARKS are legal impressions made on articles of gold or silver at the various assay offices, for the purpose of indicating the true value of the metal of which the articles are made. The marks are a series of symbols, which are embossed in a line of about three-quarters of an in. in length, and usually on every separate piece of which an article is composed. These symbols are—1. The maker's own mark or initials. 2. The standard or assay mark; viz., *for gold*, a crown, and figures denoting the number of carats fine. This means that pure gold is reckoned at 24 carats, and every part of alloy added reduces that standard number (see Carat); so that if a piece of gold-plate jewelry is marked with a crown and 18, it indicates that it consists of 18 parts of pure gold, and 6 parts of some other metal alloyed with it. Gold of nine carats is now legal, but as it is marked by the assay office, there can be no deception, if the public understand the plate-marks. If not, they may pay for pure gold, relying upon the hall-mark, when they only receive about a third part gold. *For silver*—England, a lion passant; Ireland, a harp crowned; Edinburgh, a thistle; Glasgow, a lion rampant. 3. The hall-mark of the district office—London, a leopard's head crowned; York, three lions and a cross; Exeter, a castle with two wings; Chester, three wheat-sheaves or a dagger; Newcastle, three castles; Birmingham, an anchor; Sheffield, a crown; Edinburgh, a castle and lion; Glasgow, a tree, salmon, and ring; Dublin, the figure of Hibernia. 4. The duty-mark, indicating the payment of duty, viz., the head of the reigning sovereign. 5. Each office has also its alphabetical date-mark. In London, the assay year, which commences

on May 30, is indicated by one of the first twenty letters of the alphabet. The Goldsmiths' company of London have marked thus:

From 1716 to 1756, Roman capital letters.
" 1756 " 1776, Roman small letters.
" 1776 " 1796, Old English letters.
" 1796 " 1816, Roman capital letters A to U.
" 1816 " 1836, Roman small letters a to u.
" 1836 " 1856, Old English letters A to U.
" 1856 " 1876, Small black letters a to u.
" 1876 onwards, Roman capitals, distinguished from former series by shape of shield on which they are imprinted.

Thus, E would represent the mark of Elkington's plate made in the year 1874.

PLATEN-HALLERMÜNDE VON, AUGUST, Count, 1796–1835; b. Germany. After participating as Bavarian lieutenant in the war against Napoleon I., he studied at Würzburg and Erlangen, devoting himself to philology and philosophy. In 1826 he went to Italy, only returning to Germany for a short time in 1832 and in 1833. In 1835 he fled to Sicily to escape the cholera which was raging in Naples, but succumbed to a violent fever in Syracuse the same year. He is best known by his *Polenlieder* and by his dramas *Die verhängnisvolle Gabel* and *Der romantische Oedipus.*

PLATE-POWDER, a composition used for cleaning gold and silver plate and plated articles. It is also called rouge-powder (see ROUGE). It is made by levigating rouge with three times its weight of prepared chalk, until they are thoroughly mixed into an almost impalpable powder. Sometimes putty-powder (q.v.) is used instead of rouge, and a little rose-pink added to color it. A plate-powder is also sometimes made by levigating quicksilver with twelve times its weight of prepared chalk, until it is thoroughly incorporated, and forms a gray powder. It puts a remarkable brilliancy on silver-plate, but is very injurious to it.

PLATER, GEORGE, 1736–92; b. Md.; graduated at William and Mary college, 1753; studied and practiced law, and eventually became one of the judges of the Maryland court of appeals. In 1778 he was president of the Maryland state convention which ratified the constitution of the United States; and from that year until 1781 he represented the state in congress. During the year of his death he was governor of Maryland.

PLATFORM is a term used in American politics to designate the declaration of principles, and the course to be pursued in the important issues of the campaign of a party as they are defined and formulated by the nominating convention of that party.

PLATING signifies the covering of an inferior metal with one of the precious metals, the object being to give the appearance of silver or gold to articles chiefly intended for table use. At present the articles are generally made of German silver, or some of the similar white-metal alloys; but formerly, copper, or an alloy of that metal with brass, was used; the disadvantage of which was that, as the coating of silver wore off, the red color of the copper became disagreeably apparent through the thin covering of silver. Gold is rarely plated on any other metal than silver, except for purposes of deception. Previous to the introduction of electro-plating, the method generally pursued was that which has acquired the name of *Sheffield-plating*, from the large extent to which it was carried on in that town. It consists in soldering on to one or both sides of an ingot of the baser metal a thin plate of silver. The ingot is always of an oblong shape, and is most carefully prepared on the surfaces which are to receive the silver, so that nothing shall prevent the complete union of the two. The soldering is a process requiring much care and nicety; the plates of silver are thinly coated with a concentrated solution of borax, and are then applied to the prepared surfaces of the ingot, to which they are firmly bound with iron wire, and then placed in the *plating-furnace*, and subjected to a strong heat. This furnace is so arranged that the interior can be constantly watched, and when the proper temperature is attained the workman knows the exact instant to withdraw it. The act of soldering is almost instantaneous, and fusion would immediately follow if the ingot was not quickly withdrawn. When cooled, the wire is taken off, and the ingot is taken to the rolling-mill, where it is passed backwards and forwards, of course with the silver above and below, until it is rolled out into a sheet of the exact thickness required. However thin it may be made, it is found that the relative thickness between the ingot and its layers of silver is always the same.

This method does not admit of the manufacture of any portions such as ornamental molded borders, etc.; these had, therefore, to be formed separately of copper, and were coated by the process called *silvering.* Now, however, it is found better to make them of silver rolled thin, and fill them inside with lead, to give them solidity; by this plan is avoided the annoyance of the silver rubbing off, and exposing the copper. Sheffield-plating is still made extensively, but the manufacture is rapidly declining in presence of the newer art of electro-plating. See GALVANISM.

Within a very recent period, and since the subject of electro-plating was treated under the article GALVANISM, some very remarkable applications of the process have

been discovered; for instance, it is no longer confined to the deposit of silver and gold, aluminium, silicium, titanium, tungsten, molybdenum, tin, cadmium, lead, bismuth, palladium, rhodium, iridium, and the alloys, brass and bronze, are all now deposited under patent processes. Of all these, by far the most important is the deposit of the alloys, and a very large trade has sprung up in manufactures of iron coated with brass. The importance of being able to cover a metal so cheap, yet so easily corroded as cast iron, with so ornamental an alloy as brass or bronze, can hardly be overrated. Consequently the process is carried on very extensively and satisfactorily.

PLATINUM (symb. Pt, equiv. 99—new system, 194.3—sp. gr. 21.5) is one of the "noble metals," which may be obtained in more forms than one. It is only found in the native state, usually occurring in small glistening granules of a steel-gray color, which always contain an admixture, in varying proportions, of several metals, most of which are rarely found except in association with platinum. Sometimes, however, it is found in masses of the size of a pigeon's egg, and pieces weighing ten or even twenty pounds have occasionally been found. The following table shows the composition of crude platinum ore as obtained from different parts of the globe. The analyses were conducted by Messrs. Deville and Debray:

	Columbia.	California.	Oregon.	Spain.	Australia.	Russia.
Platinum	80.00	79.85	51.45	45.70	59.80	77.50
Iridium	1.55	4.20	0.40	0.95	2.20	1.45
Rhodium	2.50	0.65	0.65	2.65	1.50	2.80
Palladium	1.00	1.95	0.15	0.85	1.50	0.85
Gold	1.50	0.55	0.85	3.15	2.40	....
Copper	0.65	0.75	2.15	1.05	1.10	2.15
Iron	7.20	4.45	4.30	6.80	4.30	9.60
Osmide of iridium	1.40	4.95	37.30	2.85	25.00	2.35
Sand	4.35	2.60	3.00	35.95	1.20	1.00
Osmium and loss	....	0.05	....	0.05	0.80	2.30

Ruthenium is also almost always present, and in the above analysis is probably included with the iridium, which it closely resembles.

There are two modes of obtaining platinum in the form of ingots from the ore, both of which require notice. The method which has been universally employed, till within the last five years, was that discovered by Wollaston, the leading steps of which were as follows: After the removal of the metals associated with the platinum, by the successive action of nitric and hydrochloric acids, the platinum itself is dissolved in aqua regia, from which it is precipitated by a solution of sal ammoniac in the form of a sparingly soluble double salt, the chloride of ammonium and platinum, represented by the formula $(NH_4Cl)_2PtCl_4$. This salt is washed and heated to redness, by which means the chlorine and ammonia are expelled, leaving the metal in the form of a gray, spongy, soft mass, known to chemists as *spongy platinum*. In this form it is very finely powdered under water, is next shaped by intense pressure into a mass, and is then exposed to an intense heat in a wind-furnace, the ingot being formed by hammering it upon its two ends. (If hammered on its sides, it splits.) This heating and forging must be repeated till the metal becomes homogeneous and ductile.

Deville and Debray have introduced an entirely new method for the extraction of platinum from its ores. They first form a fusible alloy of this metal with lead, by exposing the platinum ore—2 cwt. being used in a single experiment, with equal weights of galena and litharge gradually added, and a little glass to act as a flux—to full redness in a reverberatory furnace lined with clay. The sulphur of the galena is oxidized and expelled, and the liquid alloy of lead and platinum is allowed to rest for some time, to allow the osmide of iridium, which is not affected by the preceding operations, to sink to the bottom. The upper portions of the alloy are then decanted, and cast into ingot-molds, which are submitted to cupellation; and the metallic platinum which is left after the cupellation, is melted and refined in a furnace of lime—which is employed in consequence of its being a very bad conductor of heat—by means of the oxyhydrogen blow-pipe. The platinum obtained in this manner is nearly pure, and very ductile and malleable. For details regarding this process, which has been patented both in France and in this country, the reader is referred to the memoir "On Platinum and the Metals which accompany it," in the *Annales de Chimie et de Physique* for August, 1859.

Platinum, as obtained by either of the above processes, exhibits a bluish-white metallic luster; it is exceedingly malleable and ductile, and is very infusible, melting only before the oxyhydrogen blow-pipe, or in a very powerful blast-furnace, such as that used by Deville and Debray. It expands less by heat than any other metal, and it is usually regarded as the heaviest form of matter yet known; but, according to Deville and Debray, osmium and iridium are about equally dense. It is unaffected by atmospheric action, and does not undergo oxidization in the air at even the highest temperatures. It is not acted on by nitric, hydrochloric, sulphuric, or hydrofluoric acid, or in short, by any single acid; but in aqua regia it slowly dissolves, and forms a soluble tetrachloride. In consequence of its power of resisting the action of acids, it is of great service in experimental and manufacturing chemical processes, platinum spatulas, cap-

sules, crucibles, etc., being employed in every laboratory; while platinum stills, weighing sometimes as much as 1000 ounces, are frequently used for concentrating oil of vitriol. Platinum is, however, corroded if heated with the alkalies or alkaline earths, and especially with a mixture of nitrate of potash and hydrated potash, an oxide being formed which combines with the alkaline bases.

The form of the metal known as *spongy platinum* has been already noticed. The metal may, however, be obtained in a state of subdivision much finer than that in which it is left on heating the double chloride of platinum and ammonium—namely, in the state known as *platinum black*. In this form it resembles soot. It may be prepared in various ways, of which one of the simplest is to boil a solution of tetrachloride of platinum to which an excess of carbonate of soda and a quantity of sugar have been added, until the precipitate formed after a little time becomes perfectly black, and the supernatant liquid colorless. The black powder is then collected on a filter, washed, and dried by a gentle heat. In its finely comminuted state, either as spongy platinum or platinum black, it possesses a remarkable power of condensing and absorbing gasses, one volume of platinum black being able to absorb more than 100 volumes of oxygen. This absorption appears to be accompanied by a conversion of some or all of the oxygen into the modification known as ozone (q.v.), since the metal becomes capable of exerting the most energetic oxidizing action, even at ordinary temperatures. For example, it can cause the combustion of a jet of hydrogen, can oxidize sulphurous acid into sulphuric acid, ammonia into nitric acid, and alcohol into acetic acid, the rise of temperature in the last case being often sufficiently great to cause inflammation. Platinum in the compact form, as foil or wire, possesses similar powers, but in a far lower degree.

Platinum may be easily alloyed with most of the metals, the alloys being in general much more fusible than pure platinum. An alloy of platinum, iridium, and rhodium is found, by the investigations of Deville and Debray, to be harder, and capable of resisting a higher temperature than the pure metal.

There are 2 *oxides* of platinum, a monoxide, PtO, and a dinoxide, PtO_2, neither of which can be formed by the direct union of the elements. Excepting that the change which platinum vessels undergo when containing the caustic alkalies, etc., and exposed to a red heat, is due to the formation of a superficial layer of oxide (probably binoxide), these compounds are of little interest. The *sulphides* and *chlorides* correspond in number and composition to the oxides. Of these compounds, the tetrachloride, $PtCl_4$, alone requires notice. It is formed by dissolving platinum in aqua regia, and evaporating the solution to dryness; and it is obtained as a deliquescent, reddish-brown mass, which forms an orange-colored solution in water, from which, on evaporation, it crystallizes in prisms. It is also freely soluble in alcohol and ether. A solution of this salt is much used for the recognition and determination of potash and ammonia.

By the action of ammonia on dichloride of platinum (which is obtaincd by heating a solution of the bichloride to a temperature of 572° F. [300° C.]), several remarkable compounds are formed, which possess strong basic characters, and are of great interest in a theoretical point of view, such as platosammonium oxide, $PtO(NH_3)_2$, platin-ammonium-hydroxide, $Pt(NH_3)_2(OH)_4$, etc. There was practically no demand for platinum until the introduction of the incandescent lamp. Platinum is the only metal that can be used to pass through the glass lamp bulbs, making a tight joint, as its coefficient of expansion is nearly the same as that of glass.

PLATO, who, along with Aristotle, represents to modern Europe the whole compass of Greek speculation, was born at Athens in the year 429 B.C., shortly after the commencement of the Peloponnesian war, and the same year in which Pericles died. He was of a good family—being connected on the mother's side with Solon, and on the father's side with Codrus, one of the ancient kings of Athens. He received a good education, according to the common practice of the Greeks, in music, gymnastics, and literature. His rich and gorgeous imagination is said at first to have essayed its powers in poetry; but when about 20 years of age, having become acquainted with Socrates, he threw all his verses into the fire, and consecrated his great intellect to philosophy. When he was 20 years old the political troubles, of which the death of Socrates was only one terrible symptom, forced him to leave Athens for a season, and he resided at Megara, with Euclid, the founder of the Megaric sect. The disturbed state of his native country, doubtless, also was one cause of the frequent travels which he is reported to have made. Of these, his three visits to Sicily, during the time of the elder and younger Dionysius, are the most celebrated and the best authenticated. That he visited Italy is extremely probable; at all events, he was most closely connected with Archytas and the Pythagorean philosophers; though, as Aristotle (*Metaph.* i. 6) justly remarks, he borrowed from Heracleitus as well as from Pythagoras, and put a stamp of freshness and originality on all that he borrowed. After returning from his first visit to Sicily, being then in his fortieth year, he commenced teaching philosophy publicly, in the Academia, a pleasant garden in the most beautiful suburb of Athens, and there gathered around him a large school of distinguished followers, who maintained a regular succession after his death, under the name of the philosophers of the academy. He lived to the age of 82; was never married, and must have possessed some independent property, as he expresses himself strongly against teaching philosophy for fees, and we nowhere read of his having held any public office from which he could have derived emolument.

The principles of his philosophy are happily better known; for all his great works have been preserved, and have always been extensively read wherever the Greek language was known. The only danger to which the students of his philosophy have been exposed is the confusion of the doctrines distinctly taught by him with the exaggeration of these as afterwards worked out by the Neoplatonists of Alexandria; but this is a danger which the exact critical scholarship of modern times has put out of the way for all persons who exercise common precaution in the acquisition of knowledge. The distinctive character of the Platonic philosophy is expressed by the word idealism, as opposed to realism, materialism, or sensationalism, using these words in their most general and least technical sense, the capacity of forming and using ideas being taken as an essential virtue or quality of mind, as contrasted with matter; of thought as contrasted with sensation, of the internal forces of individuals and of the universe, as contrasted with the external forms by which these forces are manifested. As such, the ideal philosophy stands generally opposed to that kind of mental action which draws its stores principally from without, and is not strongly determined to mold the materials thus received by any type of thought or hue of emotion derived from within. In other words, the philosophy of Plato is essentially a poetical and an artistical philosophy; for poetry, painting, and music all grow out of idealism, or those lofty inborn conceptions by which genius is distinguished from talent. It is also, at the same time, a scientific philosophy, for the purest science, as mathematics—on which Plato is well known to have placed the highest value—is a science of mere ideas or forms conditioned by the intellect which deduces their laws; and, above all, it is essentially a moral and a theological philosophy; for practice, or action is the highest aim of man, and morality is the ideal of action; and God, as cause of all, is the ideal of ideals, the supreme power, virtue, and excellence to which all contemplation recurs, and from which all action and original energy proceed. The distinctive excellence of the Platonic philosophy is identical with its distinctive character, and consists in that grand union of abstract thought, imaginative decoration, emotional purity, and noble activity, which is the model of a complete and richly endowed humanity. The poetical element in Plato, so wonderfully combined with the analytical, shows itself not only in those gorgeous myths which form the peroration of some of his profoundest dialogues, but in that very dialogic form itself, of which the situation is often extremely dramatic; though this form of philosophic discussion perhaps owes its existence more to the lively temper and out-of-door habits of the Greeks, than to the special dramatic talent of Plato. On the other hand, the defects of the Platonic philosophy arise from its essential one-sidedness, as a polemical assertion of the rights of thought against the claims of the mere senses, of the stability of the eternal type against the constant change that characterizes the ephemeral form. In his zeal to submit all that is external to the imperatorial power of internal conception, the philosopher of ideas is apt to forget the obstinate and unpliable nature of that external world which he would regulate, and after projecting a grand new scheme of society, according to what appears a perfect model, shows like the architect who, after drawing out the model of a marble temple, finds he has only bricks to build it with. For this reason, extremely practical men, and those who are compelled to reason chiefly by an extensive induction from external facts, have ever felt an instinctive aversion to the Platonic philosophy; and Plato himself, by some of the strange and startling conclusions, in matters of social science, to which his ideal philosophy led, has, it must be confessed, put into the hands of his adversaries the most efficient weapons by which his ideal system may be combated.

The starting-point of the Platonic philosophy, as, indeed, it must be of all philosophy, properly so called, is the theory of knowledge. This is set forth in the *Theætetus*, the *Sophistes*, and the *Parmenides;* and in the *Cratylus*, the foundations are laid for a science of language, as the necessary product of a creature energizing by ideas. The Platonic theory of knowledge, as developed in the *Theætetus*, will be most readily understood by imagining the very reverse of that which is vulgarly attributed to Locke; viz., by drawing a strong and well-marked line between the province of thought and that of sensation in the production of ideas, and taking care that, in the process of forming conceptions, the mind shall always stand out as the dominant factor. In other words, the hackneyed simile of the sheet of blank paper, applied to the mind by extreme sensational philosophers, must either be thrown away altogether or inverted; the more active part of the operation must always be assigned to the mind. The formation of knowledge, according to Plato, may be looked on as the gradual and systematic elimination of the accidental and fleeting in the phenomenon from the necessary and permanent; and the process by which the mind performs this elimination—and it can be performed only by mind—is called *dialectics*. This word, from *dialégomai*, originally signifies only conversational discussion; thence, that discussion conducted in such scientific fashion as to lead to reliable results, i.e., strictly logical. The product of dialectics is ideas, and these ideas being the *éidê*, forms or types of things which are common to all the individuals of a species, all the species of a genus, all the genera of a family, and all the families of a class, generate classification—that is, knowledge of the permanent in phenomena—and definition, which is merely the articulate verbal expression of this permanency. The construction of the confused results of observation into the orderly array of clear conceptions, by a sort of cross-examination of the phenomena, performed by minds impassioned for truth, is exhibited as the great characteristic of the teaching of Socrates, in the

Memorabilia of Xenophon. In the dialogues of Plato, the same purification of the reason, so to speak, from the clouds of indistinct sensuousness, is exhibited on a higher platform, and with more comprehensive results. For between Socrates and Plato, notwithstanding a deep internal identity, there was this striking difference in outward attitude—that the one used logic as a practical instrument in the hands of a great social missionary and preacher of virtue; while the other used it as the architect of a great intellectual system of the universe, first and chiefly for his own time and his own place; but, as the event has proved, in some fashion also for all times and all places.

We should err greatly, however, if we looked on Plato as a man of mere speculation, and a writer of metaphysical books, like certain German professors. Neither Plato nor any of the great Greeks looked on their intellectual exercises and recreations as an end in themselves. With them, philosophy did not mean mere knowledge or mere speculation, but it meant wisdom, and wisdom meant wise action, and wise action meant virtue. The philosophy of Plato, therefore, with all its transcendental flights, of which we hear so much, was essentially a practical philosophy; all his discussions on the theory of knowledge and the nature of ideas are undertaken mainly that a system of eternal divine types, as the only reliable knowledge, may serve as a foundation for a virtuous life, as the only consistent course of action. Virtue, with Socrates and Plato, is only practical reason. As in the Proverbs of Solomon, all vice is folly, so in the philosophy of Plato, the imperial virtue is *phronēsis*—i.e., "wisdom" or practical "insight." The other two great Greek and Platonic virtues—*sōphrosynē*, "moderation" or "sound-mindedness," and *dikaiosynē*, "justice," or the assigning to every act and every function its proper place—are equally exemplifications of a reasonable order applied to action—such an order as alone and everywhere testifies the presence of mind. The theory of morals as worked out from such principles is, of course, as certain as the necessary laws of the reason which it expresses; and accordingly, the Platonic morality, like the Christian, is of that high order which admits of no compromise with ephemeral prejudice or local usage. The contrast between the low moral standard of local respectability and that which is congruous with the universal laws of pure reason, stands out as strikingly in Plato as the morality of the Sermon on the Mount in the Gospels does against the morality of the Scribes and Pharisees. Splendid passages to this effect occur in various parts of Plato's writings, particularly in the *Republic* and the *Gorgias*. In perfect harmony with the Platonic theory of noble action, is his doctrine with regard to pure emotion and elevated passion. Love with Plato is a transcendental admiration of excellence—an admiration of which the soul is capable by its own high origination and the germs of god-like excellence, which are implanted into it from above. The philosophy of love is set forth with imaginative grandeur in the *Phædrus*, and with rich dramatic variety in the *Banquet*, of which dialogue there is an English translation by Shelley. The philosophy of beauty and the theory of pleasure are set forth with great analytic acuteness in the *Philebus*. With Plato, the foundation of beauty is a reasonable order, addressed to the imagination through the senses—i.e., symmetry in form, and harmony in sounds, the principles of which are as certain as the laws of logic, mathematics, and morals—all equally necessary products of eternal intellect, acting by the creation and by the comprehension of well-ordered forms, and well-harmonized forces, in rich and various play through the living frame of the universe; and the ultimate ground of this lofty and coherent doctrine of intellectual, moral, and æsthetical harmonies lies with Plato, where alone it can lie, in the unity of a supreme, reasonable, self-existent intelligence, whom we call God, the fountain of all force, and the creator of all order in the universe; the sum of whose most exalted attributes, and the substantial essence of whose perfection may, as contrasted with our finite and partial aspects of things, be expressed by the simple term *tò agathón*—the Good. From this supreme and all-excellent intelligence, human souls are offshoots, emanations, or sparks, in such a fashion that they partake essentially of the essential nature of the source from which they proceed, and accordingly possess unity as their most characteristic quality, attest their presence everywhere by a unifying force which acts by impressing a type on whatever materials are submitted to it, and is filled with a native joy in the perception of such types, the product of the same divine principle of unity, wheresoever presented. The undivided unity and unifying force which we call the soul is immortal, being from its nature altogether unaffected by the changes of decay and dissolution to which the complex structure of the material human body is exposed. The doctrine of the immortality of the soul is most fully set forth in the *Phædo*, a dialogue which combines with the abstract philosophical discussion a graphic narrative of the last hours of Socrates, which, for simple pathos and unaffected dignity, is unsurpassed by any human composition.

The most complete and systematic exhibition of the opinions of Plato will be found in the *Republic*, or ideal commonwealth, of which an excellent English translation has been recently made by Davies and Vaughan. The *Republic* is not, as the title would lead us to suppose, a political work, like the *Politics* of Aristotle. It is, as baron Bunsen well remarked, not so much a state as a church with which this great work has to do; or at least, both a state and a church; and the church is the superior and dominating element. In the *Republic*, accordingly, we find the necessity of virtue to the very idea of social life proved in the first book; then the whole process of a complete moral and scientific education is set forth with such fullness as to throw the strictly political part

of the book, including the germs of what is now called political economy, very much into the shade. The principles and government of an ideal moral organism, of which the rulers shall be types of fully developed and perfectly educated men, is the real subject of the *Republic*, which accordingly forms a remarkable contrast to the inductive results of the thoroughly practical work of Aristotle on the same subject. Plato's commonwealth is a theoretical construction of a perfect ideal state of society; Aristotle's is a practical discussion on the best form of political government possible under existing conditions. Of the value of Plato's work, both suggestively in the world of politics, and dogmatically in the region of moral and religious speculation, there can be no doubt; but as a practical treatise on politics, it is vitiated throughout, both by its original scheme and by an inherent vice in the author's mind, which prevented him from recognizing the force of the actual in that degree which necessarily belongs to such a complex art as human government. Of this fault, the author was himself sufficiently conscious, and has accordingly, in another large political treatise, the *Laws*, endeavored, for practical purposes, to make some sort of compromise between the transcendental scheme of his *Commonwealth* and the conditions of existing society. But, however he might modify individual opinions, there was a one-sidedness about Plato's mind which rendered it impossible for him to struggle successfully with the difficulties of complex practical politics. He was too much possessed with the idea of order, and, moreover, had planted himself with too manifest a polemical attitude against Athenian democracy, to give due weight to the opposite principle of freedom, proved by experience to be so indispensable to every healthy and vigorous political development.

Physical science, in the days of Plato, stood on no basis sufficiently sure or broad to authorize a philosophy of the material universe with any prospect of success. Nevertheless, in his *Timæus*, the great philosopher of ideas has attempted this; and it is a work which, however valueless in the face of the grand results of modern chemical and kinetical research, will ever be consulted with advantage, as a grand constructive summary of the most important facts and theories of nature, known to the Greeks, before the accurate observations of Aristotle, and the extended mathematics of the Alexandrian school. The great question as to what matter is, and whence, Plato nowhere seems to settle very clearly; but the general tendency of ancient thought was towards a dualism, which recognized the independent existence of a not very tractable element called matter, in which Plato seems to have acquiesced.

The works of Plato were extensively studied by the church fathers, one of whom joyfully recognizes, in the great teacher of the academy, the schoolmaster who, in the fullness of time, was destined to educate the heathen for Christ, as Moses did the Jews. A lofty passion for Plato likewise seized the literary circle of the Medici at the period of the revival of letters in Italy. Since that time, the tyrannous sway of Aristotle, characteristic of the middle ages, has always been kept in check by a strong band of enthusiastic Platonists in various parts of Europe. Since the French revolution particularly, the study of Plato has been pursued with renewed vigor in Germany, France, and England; and many of our distinguished authors, without expressly professing Platonism—as Coleridge, Wordsworth, Mrs. Browning, Ruskin, etc.—have formed a strong and a growing party of adherents, who could find no common banner under which they could at once so conveniently and so honorably muster as that of Plato. The amount of learned labor expended on the text of Plato during the present century, has been in proportion; and in this department the names of Bekker, Ast, and Stallbaum stand pre-eminent. Prof. Jowett also, in Oxford, has made Plato his standard author for many years and published in 1871 a fine translation of the *Dialogues of Plato* (2d ed. 1892). Mr. Grote, the historian, published his *Plato and the other Companions of Socrates* in 1864 One of the best accounts of the Platonic philosophy is given in Zeller's *Phil. der Griechen*, of which the part on *Plato and the Older Academy* was translated in 1876. See Pater, *Plato and Platonism* (1893).

PLATOFF, Matvei Ivanovitch, Count, the hetman of the Cossacks of the Don, and a Russian cavalry gen., was b. on the banks of the Don, Aug. 6, 1751, and was descended from an ancient and noble family, which had emigrated from Greece. Having acquired a considerable reputation for wisdom and bravery, he was appointed by the czar Alexander I. hetman of the Cossacks; and subsequently, as a lieut.gen. in the Russian army, and afterwards as commander of the Russian irregular cavalry, he took a prominent part in the wars both with France and Turkey. After the French had evacuated Moscow, and retreated, Platoff hung upon their rear with the utmost pertinacity, wearying them out by incessant attacks, cutting off straggling parties, capturing their convoys of provisions, and keeping them in a state of continual terror and apprehension. The French historians state that Bonaparte's army suffered more loss from the attacks of Platoff's Cossacks than from privation and exhaustion. He defeated Lefebvre at Altenburg. After the rout of the French at Leipzig, he inflicted great loss upon them in their retreat, and subsequently gained a victory over them at Laon. The inhabitants of Seine-et-Marne will long remember him by the devastations and pillage committed by his undisciplined bands. He was enthusiastically welcomed by the Parisians (to their shame), and also by the English, who presented him with a sword of honor on the occasion of his visit to London in company with Marshal Blücher. The allied monarchs loaded him with honors and decorations, and the czar gave him the title of count. He

retired to his own country, there to mourn the death of his only son, who had been killed in the campaign of 1812, and died near Tcherkask in 1818. No other Russian gen. ever exercised such an influence over the men under his command, and their awe of him was not greater than their affection; but this was doubtless owing to the inflexible and speedy justice which he administered to them, and to the freedom with which he left them to rob and pillage.

PLATON'IC LOVE, the name given to an affection subsisting between two persons of different sex, which is presumed to be unaccompanied by any sensuous emotions, and to be based on moral or intellectual affinities. The expression has originated in the view of Plato, who held that the common sexual love of the race, harassed and afflicted with fleshly longings, is only a subordinate form of that perfect and ideal love of truth which the soul should cultivate. Whether such a sentiment as Platonic love can really subsist between persons of different sex has been frequently disputed; but without pronouncing positively on a point so delicate, and depending so much on differences in our spiritual organization, it may be safely affirmed that wherever a feeling calling itself by this name exists, it has undoubtedly a tendency to develop into something more definite and passionate.

PLATOON (probably from the French *peloton*) was a term formerly used to designate a body of troops who fired together. A battalion was commonly divided into 16 platoons, and each company into two platoons, the platoon thus corresponding to the present subdivision. The word is obsolete in this its original sense; but it survives in the expression "platoon exercise," which is the course of motions in connection with handling, loading, and firing the musket or rifle.

PLATT, ORVILLE HITCHCOCK, b. Washington, Conn., 1827; was secretary of state of Conn., 1857–58; in state senate, 1861–62, and speaker of the house, 1869. He was elected as a repub. to the U. S. senate, 1879; re-elected, 1885, 1890, and 1897.

PLATT, THOMAS COLLIER, b. N. Y., 1833; educated at the Owego academy; a member of the class of 1853 in Yale College, withdrawing in his junior year on account of ill health. He went into mercantile business, became president of the Tioga national bank, and was heavily engaged in lumbering in Michigan. He was clerk of Tioga co., 1859–61, and a member of congress, 1872–76. In 1879 he was made general manager, secretary, and director of the U. S. express company; in 1880 was appointed a quarantine commissioner at the port of New York; and in Jan., 1881, he was elected U. S. senator. Within a few months both he and Senator Roscoe Conkling resigned because of dissatisfaction with President Garfield's administration. He was re-elected U. S. senator in 1896. He has the reputation of being a shrewd political manager.

PLATTE, a co. in n.w. Missouri, adjoining Kansas, bounded on the s.w. and s. by the Missouri, drained also by Platte river, and Smith's fork of the Platte; traversed by the Chicago, Rock Island and Pacific, and the Kansas City, St. Joseph and Council Bluffs railroads; about 410 sq. m.; pop. '90, 16,248, chiefly of American birth. The surface is rolling and heavily wooded, the soil fertile; principal productions, corn, wheat, oats, and live stock. Co. seat, Platte City.

PLATTE, a co. in e. Nebraska, bounded on the s. by the Platte river, drained by Shell creek and the Loup fork of the Platte, traversed by the Union Pacific and the Burlington Route railroads; about 682 sq. m.; pop. '90, 15,437, chiefly of American birth. The surface is rolling, and the soil fertile. Corn, hay, oats, and wheat are the principal productions. Co. seat, Columbus.

PLATTEN-SEE. See BALATON.

PLATTE RIVER is formed by its n. and s. forks, which rise in Colorado among the Rocky mountains, and join in Lincoln co., Nebraska. Its general course is e., and it empties into the Missouri in lat. 41° 3′ n. after a course of about 450 miles. Including the forks, its length is about 1,400 miles, and it drains an area of many thousands of sq. miles. It is very shallow, and unnavigable even for small vessels.

PLATTSBURG, village, co. seat of Clinton co., N. Y., and port of entry for the Champlain district; on lake Champlain, at the mouth of the Saranac river, and on the Chateaugay and the Delaware and Hudson railroads. One of the first naval battles of the revolutionary war was fought here Oct. 11, 1776, the American vessels being commanded by Benedict Arnold. During the second war with Great Britain it was the United States headquarters for the northern frontier and the scene of the brilliant naval and land battles, in both of which the Americans were victorious. The town was settled in 1785, chiefly by emigrants from Dutchess co. and Long Island. In 1849 and 1867 it was visited by disastrous fires that destroyed the chief business portion of the town. It now contains numerous mills and manufactories, several banks, public schools and a high school, churches, a public library, home for aged ladies, home for the friendless, a state normal school, the Plattsburg academy, court-house and jail, custom-house and post-office, and barracks for United States soldiers. It is lighted by electricity, and draws its water supply from springs 7 miles distant. Large quantities of logs are floated down the Saranac river, producing annually about 25,000,000 ft. of lumber; and the product

of more than 50 iron bloom forges is brought to the village for shipment. Besides lumbering and shipping, the principal industries are the manufacture of sewing machines, shirts, and wood-pulp. Pop. '90, 7,010.

PLATTSMOUTH, city and co. seat of Cass co., Neb.; on the Missouri river and the Missouri Pacific and the Burlington Route railroads; 20 miles s. of Omaha. It has a public library, high school, electric lights, banks, several churches, the Burlington railroad car shops, brick and terra-cotta works, and cigar factories. Pop. '90, 8,392.

PLATYS'TOMA (Gr. broad-mouth), a genus of fishes of the family *siluridæ*, having a very flat (depressed) snout, and a very large mouth with six long barbels; the skin quite destitute of scales; two dorsal fins; the eyes lateral, level with the nostrils. The species are numerous, some of them attaining a large size, many of them notable for their distinct and conspicuous markings. Several are natives of the rivers of the n.e. of South America; and among these are some of the most beautiful and delicious of fresh-water fishes, as *P. tigrinum*, known among different tribes of Indians by various names—*corutto, colite, oronni*, etc., which has an elongated body, light blue, transversely streaked with black and white, and a spreading forked tail. It is both taken by baited hooks and shot with arrows by Indians, as are several other species, some of which are found as far s. as Buenos Ayres.

PLAU'EN, an important manufacturing city of Saxony, in a beautiful valley on the White Elster, 32 m. s.w. of Zwickau. It was the chief town of the Saxon Voigtland, and its castle was at one time the residence of the voigt, or imperial commissioner, but is now used as the seat of justice and other courts. Plauen contains a gymnasium, a royal palace, and numerous educational and benevolent institutions. It carries on extensive manufactures of muslin, cambric, and jaconet goods, as well as embroidered fabrics and cotton goods. In Sept. 1844, 150 buildings were destroyed by fire, and after that event, the town was almost wholly rebuilt. Pop. '95, 55,197.

PLAU'TUS, T. MACCIUS, or, less correctly, **M. ACCIUS**, the great comic poet of Rome, was b. about 254 B.C. at Sarsina, a village of Umbria. We have no knowledge of his early life and education; but it is probable that he came to Rome while still a youth, and there acquired a complete mastery of the Latin language in its most idiomatic form, as well as an extensive familiarity with Greek literature. It is uncertain whether he ever obtained the Roman franchise. His first employment was with the actors, in whose service he saved an amount of money sufficient to enable him to leave Rome and commence business on his own account. What the nature of this business was, or where he carried it on, we are not informed; we know, however, that he failed in it, and returned to Rome, where he had to earn his livelihood in the service of a baker, with whom he was engaged in turning a hand-mill. At this time—a few years before the outbreak of the second Punic war—he was probably about 30 years of age; and while employed in his humble occupation, he composed three plays, which he sold to the managers of the public games, and from the proceeds of which he was enabled to leave the mill, and turn his hand to more congenial work. The commencement of his literary career may, therefore, be fixed about 224 B.C., from which date he continued to produce comedies with wonderful fertility, till 184, when he died in his 70th year. He was at first contemporary with Livius Andronicus and Nævius: subsequently with Ennius and Cæcilius.

Of his numerous plays—130 of which bore his name in the last century of the republic—only 20 have come down to us. Many of them, however, were regarded as spurious by the Roman critics, among whom Varro in his treatise (*Quæstiones Plautinæ*) limits the genuine comedies of the poet to 21. With the exception of the 21st, these Varronian comedies are the same as those we now possess. Their titles, arranged (with the exception of the Bacchides) in alphabetical order, are as follows: 1, *Amphitryo;* 2, *Asinaria;* 3, *Aulularia;* 4, *Captivi;* 5, *Circulio;* 6, *Casina;* 7, *Cistellaria;* 8, *Epidicus;* 9, *Bacchides;* 10, *Mostellaria;* 11, *Menæchmi;* 12, *Miles;* 13, *Mercator;* 13, *Pseudolus;* 15, *Pœnulus;* 16, *Persa;* 17, *Rudens;* 18, *Stichus;* 19, *Trinummus;* 20, *Truculentus;* 21, *Vidularia.* As a comic writer, Plautus enjoyed immense popularity among the Romans, and held possession of the stage down to the time of Diocletian. The vivacity, the humor, and the rapid action of his plays, as well as his skill in constructing plots, commanded the admiration of the educated no less than of the unlettered Romans; while the fact that he was a national poet prepossessed his audiences in his favor. Although he laid the Greek comic drama under heavy contributions, and "adapted" the plots of Menander, Diphilus, and Philemon with all the license of a modern playwright, he always preserved the style and character native to the Romans, and reproduced the life and intellectual tone of the people in a way that at once conciliated their sympathies. The admiration in which he was held by his contemporaries descended to Cicero and St. Jerome; while he has found imitators in Shakespeare, Molière, Dryden, Addison, and Lessing, and translators in most European countries. The only complete translation of his works into English is that by Thornton and Warner (5 vols., 1767–74). Unfortunately the text of his plays, as they have come down to us, is in such a very corrupt state, so defective from lacunæ, and so filled with interpolations, that much yet remains to be done by the grammarian and the commentator before they can be read with full appreciation or

comfort. The *editio princeps* was printed at Venice in 1742. Weise and Fleckeisen have given us good modern editions; but that of Ritschl (1st ed. 1848–54; 2d ed. 1871) shows such admirable acuteness and learning as to have superseded all others.

PLAYFAIR, JOHN, a Scottish mathematician and natural philosopher, was b. at Benvie in Forfarshire, March 10, 1748. His father, who was minister of the united parishes of Liff and Benvie, sent him to the university of St. Andrews at the age of 14, to study with a view to the ministry; and here Playfair gained great reputation as a diligent and successful student, especially in mathematics and natural philosophy; so much so that, while a student, he for some time discharged the duties of the natural philosophy chair during the illness of the professor. In 1773 he entered the ministry, and succeeded his father in the parish of Liff and Benvie. During his leisure hours, he still prosecuted his favorite studies, the fruits of these labors being two memoirs, *On the Arithmetic of Impossible Quantities* and *Account of the Lithological Survey of Schihallion,* which were communicated to the royal society of London. In 1782 he resigned his parochial charge to superintend the education of the sons of Mr. Ferguson of Raith; and in 1785 he became joint-professor of mathematics along with Adam Ferguson in the university of Edinburgh; but exchanged his chair for that of natural philosophy in 1805. He took the part of Mr. (afterwards Sir John) Leslie (q.v.), his successor in the mathematical chair, and published a pamphlet full of biting satire against the "new-sprung zeal for orthodoxy." He became a strenuous supporter of the "Huttonian theory" in geology, and after publishing his *Illustrations of the Huttonian Theory of the Earth* (Edin. 1802), he made many journeys for the sake of more extensive observations, particularly in 1815, when he visited France, Switzerland, and Italy. He died at Edinburgh, July 19, 1819. Playfair, according to Jeffrey (*Annual Biography,* 1820), "possessed in the highest degree all the characteristics both of a fine and a powerful understanding; at once penetrating and vigilant, but more distinguished, perhaps, by the caution and success of its march, than by the brilliancy or rapidity of its movements." Playfair was, during the later part of his life, secretary to the royal society of Edinburgh. From 1804 he was a frequent contributor to the *Edinburgh Review,* criticising the works of Laplace, Zach, and Kater, and the great trigonometrical surveys, both French and English, which had just been completed. He also wrote the articles "Æpinus" and "Physical Astronomy," and an incomplete "Dissertation on the Progress of Mathematical and Physical Science" for the *Encyclopedia Britannica.* His contributions to the *Transactions of the Royal Society of Edinburgh* are numerous and exceedingly varied, a treatise on "Naval Tactics" even appearing among them. His separate works are the *Elements of Geometry* (Edin., 1795), containing the first six books of Euclid, with supplementary articles on trigonometry, solid geometry, and the quadrature of the circle; and his *Outlines of Natural Philosophy* (Edin. 1812 and 1816), being the heads of his lectures delivered in the university on that subject. A third volumes of the *Outlines,* completing the work, was promised, but never appeared.

PLAYFAIR, Baron LYON, K.C.B.; b. India, 1819; educated at St. Andrews college; at an early age (in 1834) took a course in chemistry at Glasgow. In 1837 he revisited India for his health; returned the next year, and after studying under the celebrated German chemist Liebig, became the manager of large calico mills at Clitheroe, Scotland. In 1843 he was appointed professor of chemistry at the Manchester Royal Institution. In the world's exhibition in London he was at the head of the department of juries, and for his valuable services was made a companion of the bath. At the exhibition of 1862 he held the same position. The chemical society of London elected him president in 1857, and in 1858 he was appointed to the chair of chemistry in Edinburgh university. He became a member of several royal commissions for examining into questions concerning science or health. In 1868 Dr. Playfair was returned to parliament as a liberal from the Scotch universities, and afterward was prominent in political matters. In 1873 he was appointed postmaster-general and became a privy-councilor. He was raised to the peerage as first baron Playfair of St. Andrews, and appointed a lord in waiting in 1892. He edited and wrote many treatises on scientific and technical topics, and published lectures and addresses on universities, education, and the progress of sanitary reform.

PLEA is a technical term in law. In England and America it has a very restricted meaning, being confined to the pleading of a defendant to an action at common law. Now in all actions in the English courts it is called the "statement of defense."—In Scotland it is not used in the same sense, but denotes the short legal ground on which a party, whether pursuer or defender, bases his case or pleading. Hence the pleas in law are only short propositions of law. Pleas are subdivided according to their subject-matter, into pleas dilatory and peremptory, pleas of abatement, pleas to the jurisdiction. Pleas in bar are the same as peremptory pleas; but in criminal cases in England, special pleas in bar are pleas stating some ground for not proceeding with the indictment, such as a plea of formal acquittal or autrefois acquit; or of conviction, or autrefois convict; or a plea of pardon.—In Scotland a "plea of panel" means a plea of guilty or not guilty. Pleas of the crown was an expression anciently used to denote the divisions of criminal offenses generally, as in the well-known work called *Pleas of the Crown,* by Sir Matthew Hale and other writers. The phrase was so used because the sovereign was supposed in law to be the person injured by

every wrong done to the community, and therefore was the prosecutor for every such offense.

PLEADING, as a legal term, has two meanings—a restricted and a general meaning. In the former sense, it is a generic term to denote the written formula containing the subject-matter of a litigant's demand, or claim, or of his defense or answer thereto. In its general sense, it denotes that system of rules on which the particular pleadings of litigants are framed. In the practice of English common law, the pleadings in an action were called the declaration, plea, replication, rejoinder, surrejoinder, rebutter, surrebutter, etc.—the first being a statement of the plaintiff's demand; the second, the defense thereto, and so on, each alternately answering the other, until the parties arrive at a stop, called an issue, which means a proposition of fact, which the one affirms, and the other denies. When an issue is arrived at, the parties can go no further; and the next step is to send the issue before a jury, that they may decide it. When the parties differ, not on a question of fact, but on one of law, it is called a demurrer, which must be decided by the court. These technical names have, however, been recently much changed. In the high court of justice, the plaintiff's pleading is called his "statement of claim;" then follow the "statement of defense," the reply, etc., there being no further pleadings.—In Scotland, the pleadings of the parties are called the summons (including the condescendence), the defenses or answers, the revised condescendence, the revised answers, etc. The peculiar technical rules to which the pleadings of parties must conform are capable of being understood only by lawyers.

It may be added that in the common-law system until recently followed in most of our states it differed greatly from the equity pleading and that employed in the admiralty courts. In the last the "libel" of the complainant or "libelant" corresponds to the "declaration" in common law and to the "bill" in equity proceedings, and each subsequent step was set forth in an "allegation." In equity, the plea responding to the bill is called the "answer," and subsequent pleadings were less formal and technical than in common law. At common law pleas subsequent to the declaration were either of the nature of a traverse, directly contradicting the allegations of the plea next preceding, and thus offering an opportunity to close the issue; or in the nature of confession and avoidance, not denying the truth of the facts claimed by the declaration, but setting up new matter to show the plaintiff not entitled to his action, and to avoid the effect of his allegations. Pleas may be peremptory or dilatory; the former altogether denies a right of action; the latter sets out that the suit has been brought in improper form, or against the wrong party, or before a court lacking jurisdiction. A *special plea in bar* differs from the *general issue* in that the latter denies all the material allegations of the preceding plea; and from a *special issue*, which does not set up new matter but denies some part which, it is claimed, goes to the *gist* of the action. The issue finally reached may be either one of law, raised by a demurrer; or of fact, as on the acceptance of a traverse. A plea *puis darrein continuance* sets out that new matter of defense has come to the knowledge of the party presenting the plea, since the last continuance of the case, or the last stage of the suit. The system of common-law pleading was extremely technical and formal, required great accuracy and precision, and the pleas were cumbered with obsolete and redundant phraseology. In England the old system has been greatly improved by acts of parliament, and in the United States the codes of procedure of a majority of the states have abolished the common-law pleadings, and have done away with the distinction between legal and equitable suits, admitting equitable defenses in all suits. The "complaint" usually takes the place of the declaration, the demurrer is retained, the response of the defendant is termed the "answer," and the pleadings never extend beyond the plaintiff's "reply" to the answer. The one point insisted upon is that the conflicting claims of the parties shall be clearly and distinctly set out, and the points in dispute brought within the jurisdiction and cognizance of the court. The rules of pleading in criminal practice are similar to those in civil practice. The pleas are of five kinds: plea of guilty; to the jurisdiction; in abatement; in demurrer, and pleas in bar. Pleas in bar (in criminal cases) may be of four kinds: former conviction; former acquittal; pardon; and "not guilty." On refusal of an accused to plead, the court may order a plea of "not guilty" to be entered. A plea of "nolo contendere" allows an inferior court to give verdict on an *ex-parte* hearing, and is made for the purpose of at once taking the case to a higher court. In England a prisoner accused of felony who refused to plead, was formerly subjected to the pressure of heavy weights until he yielded or died. The last application of this *peine forte et dure* was in 1741.

PLEASONTON, Alfred, b. Washington, D. C., in 1824; graduated at West Point, 1844, and brevetted 2d lieut. 1st dragoons; maj. 2d cavalry, 1862; served in the Mexican war and brevetted 1st lieut. for bravery at Palo Alto and Resaca de la Palma: afterward on frontier duty as acting assistant adj.-gen.; in the war of the secession commanded his regiment from Utah to Washington, and served with it through the peninsular campaign, 1862; during which he was appointed brig.-gen. of volunteers; commanded a division of cavalry in the army of the Potomac that followed Lee's army into Maryland; was engaged at Boonsboro, South Mountain, Antietam, and in the pursuit afterward; at Fredericksburg steadily engaged the enemy's cavalry; at Chancellorsville arrested

the advance of Stonewall Jackson's corps when it seemed about to drive all before it. Having been made maj.-gen., he took part in numerous actions preceding the battle of Gettysburg, in which also he was commander-in-chief of the cavalry; transferred to Missouri, 1864, he drove Gen. Price out of the state; was mustered out of the volunteer service, 1866; resigned from the regular army, 1868; for several years was a collector of internal revenue. He d. in 1897.

PLEASANTS, a co. in n.w. West Virginia, bounded on the n.w. by the Ohio ; about 150 sq.m.; pop. '90, 7539, with colored. The surface is rolling or hilly, and heavily wooded. The soil is fairly fertile. The principal productions are corn, wheat, oats, potatoes, and grass. Much petroleum is exported. Co. seat, St. Marys.

PLEBEIANS (Lat. *plebs*, from the same root as Lat. *impleo*, to fill: and Gr. *plethos*, multitude), the common people of Rome; one of the two elements of which the Roman nation consisted. Their origin, as a separate class, is to be traced partly to natural, and partly to artificial causes. The foundation of Rome, probably as a frontier-emporium of Latin traffic (according to Mommsen's suggestion), would bring about the place a number of inferior employés, clients, or hangers-on, of the enterprising commercial agriculturists who laid the primitive basis of the material and moral prosperity of the city. These hangers-on were the original plebeians, or non-burgesses of Rome, whose numbers were constantly increased by the subjugation of the surrounding cities and states. Thus, tradition states that, on the capture of Alba, while the most distinguished citizens of that town were received among the Roman patricians, the greater part of the inhabitants, likewise transferred to Rome, were kept in submission to the *populus* or patricians of Rome—in other words, swelled the ranks of the plebeians. Similar transfers of some of the inhabitants of conquered towns are assigned to the reign of Ancus Martius. The order of plebeians thus gradually formed soon exceeded the patricians in numbers, partly inhabiting Rome, and partly the adjoining country. Though citizens, they were neither comprehended in the three tribes, nor in the *curiæ*, nor in the patrician *gentes*, and were therefore excluded from the comitia, the senate, and all the civil and priestly offices of the state. They could not intermarry with the patricians.

The first step (according to traditionary belief) towards breaking down the barrier between the two classes was the admission, under Tarquinius Priscus, of some of the more considerable plebeian families into the three tribes. Servius Tullius divided the part of the city and the adjacent country which was inhabited by plebeians, into regions or local tribes, assigning land to those plebeians who were yet without it. The plebeian tribes, with tribunes at their head, formed an organization similar to that of the patricians. The same king further extended the rights of the plebeians by dividing the whole body of citizens, patrician and plebeian, into five classes, according to their wealth, and forming a great national assembly called the *comitia centuriata*, in which the plebeians met the patricians on a footing of equality; but the patricians continued to be alone eligible to the senate, the highest magistracy, and the priestly offices. These newly acquired privileges were lost in the reign of Tarquinius Superbus, but restored on the establishment of the republic. Soon afterwards, the vacancies which had occurred in the senate during the reign of the last king, were filled up by the most distinguished of the plebeian equites, and the plebeians acquired a variety of new privileges by the laws of Valerius Publicola. The encroachments on those privileges on the part of the patricians, began the long-continued struggle between the two orders, which eventually led to the plebeians gaining access to all the civil and religious offices, acquiring for their decrees (*plebiscita*) the force of law. Under the Hortensian law (286 B.C.), the two hostile classes were at last amalgamated in one general body of Roman citizens with equal rights. Henceforth, the term *populus* is sometimes applied to the plebeians alone, sometimes to the whole body of citizens assembled in the *comitia centuriata* or *tributa*, and *plebs* is occasionally used in a loose way for the multitude or populace, in opposition to the senatorial party. See PATRICIAN.

PLÉBISCITE, the name given, in the political phraseology of modern France, to a decree of the nation obtained by an appeal to universal suffrage. Thus, Louis Napoleon, for example, was chosen president, and subsequently emperor, by a plébiscite. The word is borrowed from the Latin; but the *plebiscitum* of the Romans properly meant only a law passed at the *comitia tributa*, i.e., assembly of the *plebs*, or "commons," as distinguished from the *populus*, or the "nobles;" and although it was ultimately obligatory on both classes of the community, it, of course, could only refer to such matters as it was within the province of the *comitia tributa* to legislate upon, and could not fundamentally alter or destroy the constitution.

PLECTOG'NATHI, in the system of Cuvier, and also in that of Müller, an order of osseous fishes, but having the skeleton less perfectly ossified than osseous fishes generally; the skin furnished with ganoid scales or spines; and particularly characterized by having the maxillary and premaxillary bones anchylosed or soldered together. The gill-lid and rays are concealed under the thick skin, with only a small opening. The ribs are very short, and there are no distinctly developed ventral fins. The fishes belonging to this order are not many. They are regarded as a connecting link between the osseous and the cartilaginous fishes.

PLEDGE is the depositing of a chattel or movable with a creditor in security of a debt, and is a contract between the parties that the pledgee shall keep the chattel till the debt is paid. In England when A pledges property with B for a debt, and other debts are incurred, B cannot retain the pledge for the additional debts; but in Scotland this can be done. When chattels are pledged in England for debt the pledgee may sell the goods if the debt is not paid at the time agreed, or within a reasonable time after notice given; but in Scotland this can only be done by getting the authority of the sheriff and a warrant to sell the goods. Owing to the frequent occasions of poor and needy persons to pledge their goods in order to procure advances of money for temporary purposes, the legislature has enacted special laws to regulate these contracts. See PAWNBROKING.

PLE'IADES, in Greek mythology, were, according to the most general account, the seven daughters of Atlas and Pleione, the daughter of Oceanus. Their history is differently related by the Greek mythologists: according to some authorities they committed suicide from grief, either at the death of their sisters, the Hyades, or at the fate of their father, Atlas (q.v.); according to others they were companions of Artemis (Diana), and being pursued by Orion (q.v.), were rescued from him by the gods by being translated to the sky; all authorities, however, agree that, after their death or translation, they were transformed into stars. Only six of these stars are visible to the naked eye, and the ancients believed that the seventh hid herself from shame that she alone of the Pleiades had married a mortal, while her six sisters were the spouses of different gods. Their names are Electra, Maia, Taygete, Alcyone, Celæno, Sterope (the invisible one), and Merope.

In astronomy a group or constellation of six stars placed on the shoulder of Taurus, the second sign of the Zodiac, and forming, with the pole-star and the twin Castor and Pollux, the three angular points of a figure which is nearly an equilateral triangle. Many believe, from the uniform agreement that the Pleiades were "seven" in number, that the constellation at an early period contained "seven" stars, but that one has since disappeared; not a very uncommon occurrence.

The name *Poetical Pleiades* is frequently applied to reunions of poets in septenary groups; and this use of the word dates from the time of the Ptolemies—the originator of the first being Ptolemy Philadelphus, who, from the number of the Greek poets that flocked to Alexandria, chose out seven, whom he treated with special distinction, and denominated his *pleiad*. His example was followed by Charlemagne; and the same system was kept up by the "Compagnie des Sept Mantenadors del gay Saber," or the "Compagnie des Sept Troubadours de Toulouse," down till the 17th century. Such associations were valuable as promoting an interchange of ideas and opinions by the most eminent in the same department of letters, and creating a kind of *esprit du corps*.

PLEIOCENE. See PLIOCENE.

PLEIOSAURUS. See PLIOSAURUS.

PLEISTOCENE (Gr. most recent), or NEWER PLEIOCENE, terms introduced by sir Charles Lyell to designate the most recent tertiary deposits, the organic remains of which belong almost exclusively to existing species. Within the last few years, no section of the earth's crust has received so much attention as the strata included under this name. The obscurity arising from great antiquity and metamorphic changes in deposits, and the consequent necessity of calling to some extent on the imagination in investigations into the older strata, have always thrown a peculiar charm round geology; but the examination of the little-changed newer deposits, containing animals scarcely differing in genera from, and many of them the same even in species as, those now living, being based on simple observation, has been overlooked, although the best method in all obscure inquiries is that which starts from the known, and gradually proceeds to the unknown. The paleozoic rocks have been carefully grouped and classified, and the fossils described and figured; while the order and contents of the pleistocene deposits are little known. Their isolated nature to some extent accounts for this: but, on the other hand, as they exhibit the changes that have immediately preceded the present order of things, and so give us the first sure footing in our progress downward, they deserve careful attention.

Not only in organic contents, but in physical conditions under which they were deposited, the pleistocene strata show that the earth, as regards its general temperature, was, at the time of their deposition, in a condition nearly approaching to its present. There is consequently a considerable difference in the deposits and fossils of this period in the different regions of the world. The alluvial pampas of South America and the gravels of Australia exhibit, by their structure and contents, a temperature of some warmth; while corresponding deposits of Britain and the continent show a state of cold that is scarcely conceivable at so recent a period. The whole of northern Europe must have been under ice like the interior of Greenland at the present day. Perhaps the best classification of the deposits is one based on the relation which they bear to the temperature of the period when they were formed. The oldest pleistocene deposits represent a time of intense cold. They were formed at the bottom of a sea into which immense glaciers forced their way. The fine mud in which the organic remains are buried was obtained from the melting glaciers. All the shells belong to species now living in arctic or boreal seas. The Bridlington beds, near Flamborough Head, consisting of sand, clay,

and pebbles, with numerous marine shells, belong to this period. Of the 63 species determined by Dr. Woodward, one-half are at present living only in seas n. of Britain. The clay deposits on the e. of Scotland, at Elie and Errol, lately described by the rev. Thomas Brown, contain fossils that have a similar arctic facies. The shells of the Bridlington, Elie, and Errol deposits differ from those of the other pleistocene strata in being much more arctic, and they consequently show that the cold had reached its climax at the time of their formation. To this period most probably belongs the boulder-clay of the s. of England, which contains erratics from Scandinavia. Both the clay and the boulders seem to have been transported to their present position by floating icebergs.

The temperature, however, after a time improved, reducing the extent of the ice-covering, and driving the arctic fauna northward from our shores. In the Norwich Crag we find a larger proportion of southern species, only one-sixth of these being truly arctic. This deposit, found in the neighborhood of Norwich, consists of beds of sand and gravel which contain fresh-water and marine shells, and the bones of large mammalia. Contemporaneous with the Norwich Crag are the marine deposits of the Clyde, at least the older of them, for though the fossils of all the beds have hitherto been grouped together, they certainly represent two periods, which differ from each other by reason of the increasing temperature. While these beds were being deposited around the shores, the ice was disappearing from the land. The glaciers were gradually creeping inward, leaving an ever-increasing margin of bare land between the glaciers and the sea, which they covered with a continuous layer of mud and rubbed stones—the materials taken up in their progress over the surface—and so forming the boulder-clay of Scotland and the n. of England. This is a remarkable deposit of unstratified mud, the character and color of which is influenced by the rocks on which it rests, and from which it was derived. It contains numerous rounded and polished blocks of stone of various sizes, promiscuously scattered through it, the whole seeming to be the result of an irregular pell-mell hurrying forward and deposition of the materials. It has been always a puzzle to geologists (see BOULDER-CLAY); but Mr. Geikie, in his recently published memoir, by showing it to be the terminal moraine formed by the slowly retreating sheet of glacier-ice, has given an explanation which meets all the singular phenomena connected with it. Connected with the disappearance of glaciers, are the lateral moraines which exist on many hillsides; and perhaps a little later, the long ridges of gravel which are called kames in Scotland, and eskers in Ireland. The loamy deposits of the valleys of the Rhine and the Danube, known as the loess, were formed at this time by the fine mud from the glaciers, with which every torrent rushing from the icy caverns at the termination of a glacier is charged, and which is now forming a similar deposit in some places on the coast of Greenland.

When the glaciers began to disappear, mammalia again occupied the land; their remains, we have already seen, occur in the Norwich Crag. They continued to increase as the conditions for their existence improved. The caves of the British islands and the continent were inhabited by hyenas, bears, and other wild beasts, which have left their remains buried in the mud at the bottom of the caves. The raised sea-beaches of this period contain the shells of mollusca now living in the neighboring seas. In many places around the shores of Britain and Ireland, submarine forests are met with dipping down under low water, and exhibiting the stumps and roots of trees, in the position of growth belonging to species now living in Britain. Some of the older peat-bogs require to be placed also among the later pleistocene deposits.

The classification, then, of these strata, which we propose, from the light thrown on them by recent observation, may be put into the following tabular form. The subdivisions are the names of recognized deposits, and though arranged in tabular series, the order is not one of strict sequence, representing the superposition of the different beds; they are all very local deposits, and many of them, though differing in character, were formed contemporaneously:

Post-glacial	Peat-bogs. Submarine forests. Modern raised sea-beeches. Cave deposits.
Glacial	Loess. Kames and eskers. Lateral moraines. Boulder-clay. Newer Clyde beds. Older Clyde beds.
Arctic	Elie, Errol, and Tirie clay beds. Bridlington beds.

Many speculations have been made as to the cause of the remarkable change of temperature, from the comparatively warm period of the pleiocene deposits, to the extreme cold of the early pleistocene strata, and the subsequent gradual return to the warmer temperature of the present period. The most probable is that it resulted from an extensive depression of the land of the northern hemisphere in some parts, and its elevation in others during the period. Deposits of glacial shells have been found more than 1000 ft.

above the sea-level in Wales. A depression much less than this, in the isthmus of Panama, would give a different direction to the gulf stream, and so deprive western Europe of its benignant influences. It would also put the immense sandy Sahara under water; and that it has been so at a comparatively recent period has been clearly established by the discovery lately of existing marine shells (including *cardium edule*) over an extensive district of the desert. Without the Sahara the s. of Europe would have no burning dry sirocco, which now melts the glaciers of the Alps; but instead, a comparatively cold sea-breeze, laden with moisture, which would to a large extent feed them. The existence of a greater quantity and a higher elevation of land near the north pole would also depress the temperature. These and similar causes would do much, if they were not in themselves sufficient, to produce the extreme cold of the arctic period.

The classification of the British strata will suit, in a general way, the whole of the north temperate zone, for throughout the whole of the northern regions of Europe, Asia, and America similar conditions existed, producing similar physical changes, and the whole region formed one zoological province inhabited by the mammoth, mastodon, and their contemporaries. A warmer climate prevailed at this period in South America, and the fossil animals there belong to types still peculiar to that continent, though of a size immensely greater than their living representatives. The megatherium, mylodon, and megalonyx were the gigantic forerunners of the living sloth; and the small armadilloes were anticipated by the glyptodon. The llamas, opossums, tapirs, and prehensile-tailed monkeys are the diminutive representatives of similar forms in the pleistocene period. The peculiar marsupial fauna of Australia had also its gigantic forerunners during this period. The skull of one species (diprotodon, an animal between the kangaroo and the wombat), now in the British museum, measures 3 ft. in length. The huge wingless dinornis, and its allies of New Zealand, were nearly allied to the small wingless apteryx, now living in that island.

The question of the antiquity of man is intimately associated with the pleistocene deposits. Whatever be the age of the beds in which either the remains of man or works of art have been found, it is certain that none of them pass the horizon of the boulder-clay. It is, however, equally certain that undoubted evidences of his existence contemporaneously with the mammoth and woolly rhinoceros, with the cave-lion and hyena, have been found in Britain; and setting aside the various French and Belgian caves and gravel deposits about which geologists are, with good cause, so divided, there is evidence in the knives, pins, etc., manufactured from the bones of the large reindeer, found in caves at Bruniquel and elsewhere, that man hunted this huge extinct animal. Its contemporaries, as far as the associated remains from these caves have been determined, yet survive: these were the chamois, ibex, horse, fox, wolf, hare, raven, partridge, and salmon. However far, when measured by years, this carries back the first appearance of man on the globe, geologically speaking, the time is insignificant as compared with the vast lapse of ages represented by even a single formation; still it represents a period in which many remarkable changes have taken place.

PLENIPOTENTIARY. See ENVOY.

PLENISHING, in the law of Scotland, denotes the furniture of a house or stocking of a farm. The term is now seldom used, except in the law relating to heirship movables (q.v.).

PLEONASM (Gr. *pleon*, more), a term employed in rhetoric to denote superfluity of expression.

PLESIOSAU'RUS (Gr. near to a lizard), a remarkable genus of fossil sea-reptiles, the species of which are found in the lias, oolite, and cretaceous measures. Its remains are so abundant and so perfectly preserved, that we are as well acquainted with skeletons of many of its species as we are with those of any living animals. These represent a strange animal, the structure of which Cuvier considers to be the most singular, and its character the most anomalous, that have been discovered amid the ruins of former worlds. In the words of Buckland, "To the head of a lizard, it united the teeth of a crocodile, a neck of enormous length, resembling the body of a serpent, a trunk and tail having the proportions of an ordinary quadruped, the ribs of a chameleon, and the paddles of a whale." See illus., OOLITE GROUP, vol. X.

The skull is small and depressed. From the nostrils backward, it is quadrate; it suddenly contracts at the nostrils, and is continued into a parallel-sided apex, which is sometimes slightly swollen at the point. No sclerotic plates have been found in the orbits. The rami of the lower jaw are remarkably expanded at their anterior anchylosed extremity. No intervening vacuity separates the angular and surangular pieces, as in the crocodiles, but they are joined throughout, as in the lizards. The teeth occupy distinct cavities; they are sharp-pointed, long, slender, circular in cross-section, and with fine longitudinal ridges on the enamel. The most striking peculiarity of the vertebræ is the great length of the neck-portion, which is composed of from 20 to 40 vertebræ. The articular surfaces of the bodies of the vertebræ are either flat or slightly convex in the center, with a concavity round the periphery. The cervical vertebræ consist of a centrum, neural arch, and two ribs, which articulate into two pits on the sides of the centrum. In the dorsal vertebræ, the ribs are articulated to diapophyses from the neural arch; and in the tail, they gradually descend again to the sides of the centrum. The

tail is much shorter than in the ichthyosaur. In the abdominal region the extremities of each pair of ribs are connected below by the development of the hæmal spine.

The two pair of limbs were equal in size and shape, with probably a single exception. The bones of the hind-limbs closely correspond in number, arrangement, and form with those of the fore-limbs, so that the descriptions of the one set answer to the corresponding bones of the other. The humerus is a stout and moderately long bone, curved slightly backwards, rounded at its proximal extremity, and flattened as it approaches the elbow joints. The radius and ulna are short and flat bones—the former straight, the latter reniform, with the concavity towards the radius. The carpus consists of six to eight flat round bones in a double row. The five metacarpals are long, slender, and slightly expanded at both ends. The numerous phalanges are alike in form, but progressively decrease in size. The radial digit has generally three; the second from five to seven; the third, eight or nine; the fourth, eight; and the fifth, five or six phalanges. The limbs were covered with integument, so as to form simple undivided paddles, as in the turtle.

The supposed habits of the plesiosaur are thus described by Conybeare: "That it was an aquatic, is evident from the form of its paddles; that it was marine, is almost equally so, from the remains with which it is universally associated; that it may have occasionally visited the shore, the resemblance of its extremities to those of the turtle may lead us to conjecture; its motion must have, however, been very awkward on land; its long neck must have impeded its progress through the water, presenting a striking contrast to the organization which so admirably fits the ichthyosaur to cut through the waves. May it not, therefore, be concluded—since, in addition to these circumstances, its respiration must have required frequent access to the air—that it swam upon or near the surface, arching back its long neck like the swan, and occasionally darting it down at the fish which happened to float within its reach? It may perhaps have lurked in shoal-water along the coast, concealed among the sea-weed, and, raising its nostrils to the surface from a considerable depth, may have found a secure retreat from the assaults of dangerous enemies; while the length and flexibility of its neck may have compensated for the want of strength in its jaws, and its incapacity for swift motion through the water, by the suddenness and agility of the attack which they enabled it to make on every animal fitted for its prey which came within its reach."

The first remains of this animal were discovered at Lyme Regis in 1823. Since then 22 species have been described, the specific differences chiefly resting on peculiarities in the form and structure of the vertebræ.

PLESKOV. See Pskov.

PLESSIS, Joseph Octave, 1763–1825; b. Montreal; entered the priesthood, and was appointed rector of Quebec cathedral, and secretary to the bishop. In 1797 he was chosen coadjutor to bishop Denaud, but the death of Pius VI. prevented the ratification of the election till 1800. He was then given the title of bishop of Canada. His election caused a dispute with the British government, which claimed the right of presentation to all bishoprics; but its claim was successfully contested by the bishop. He founded the college of Nicolet, and greatly increased the facilities for both primary and secondary instruction. In 1818 he became, by royal appointment, a member of the legislative council of Canada. In 1819 he visited Rome, and sought to have all British North America made one ecclesiastical district, with an archbishop at Quebec, and suffragan bishops in the other dioceses.

PLETH'ORA (Gr. "fullness" or "excess"), designates a general excess of blood in the system. It may arise either from too much blood being made, or from too little being expended. The persons who become plethoric are usually those in thorough health, who eat heartily and digest readily, but who do not take sufficient bodily exercise, and do not duly attend to the action of the excreting organs. With them the process of blood-making is always on the increase, and the vessels become more and more filled, as is seen in the red face, distended veins, and full pulse. The heart is excited and overworked, and hence palpitation, shortness of breath, and probably a sleepy feeling, may arise; but these symptoms, instead of acting as a warning, too often cause the abandonment of all exercise, by which the morbid condition is aggravated. The state of plethora thus gradually induced may be extreme without any functions materially failing, and yet the subject is on the verge of some dangerous malady, such as apoplexy, or structural disease of the heart or great vessels, or of the lungs, kidneys, or liver.

Plethora is said to be *sthenic* when the strength and irritability of the muscular fibers (especially of the heart and arteries) are fully or excessively developed. This form commonly affects the young and active, and those of sanguineous nature. The blood is rich in red cells and fibrine; and there is a tendency to general febrile excitement, active hemorrhages, fluxes, and inflammation. A natural cure is thus often effected by the supervention of an attack of bleeding from the nostrils or from piles, or mucous or bilious diarrhea. The plethora is said to be *asthenic* (Gr. *a*, not, and *asthenos*, strength) when there is a deficiency of contractility and tone in the muscular fiber. In this case, the heart and vessels, instead of being excited (as in sthenic plethora) by the augmented quantity of blood, are oppressed by its load, and cannot duly expel their accumulated contents. The face is purple instead of red; the extremities cold, and the excreting

organs sluggish. This form affects persons weakened by age, excesses, or previous disease. It tends to produce congestions and passive hemorrhages, fluxes, and dropsies; and, if continued, structural changes, such as dilatation of the heart, enlarged liver, varicose veins, etc.

In *sthenic* plethora, blood-letting is the first remedy, and this, with the continued use of aperient medicine and a sparing diet, is often sufficient to complete the cure. If these means fail, recourse must be had to antimonials, salines, digitalis, and sometimes mercury or colchicum. In the *asthenic* form, Dr. Williams (to whose article on "plethora," in his *Principles of Medicine*, we refer our readers for further details) observes that "the continued use of alterative aperients and diuretics, such as mild mercurials, with rhubarb, aloes, or senna, salines and taraxacum, nitric acid, iodide of potassium, etc., may prepare the way for various tonics, such as calumba, bark, and iron." He also recommends the use of the Cheltenham, Leamington, and Llandrindod waters; first the saline, which are aperient and diuretic; and afterward the chalybeate, which, although tonic, usually contain enough of saline matter to keep the secretions free. Food may be taken more freely than in the sthenic form; and in both varieties, as much exercise in the open air should be taken as can be borne without causing exhaustion.

PLEU'RÆ. Each lung is invested externally by a very delicate serous membrane termed the *pleura*, which, after inclosing the whole organ, except at its root, where the great vessels enter it, is reflected upon the inner surface of the thorax or chest. That portion of the pleura which is in contact with the surface of the lung is called the *pleura pulmonalis*, or visceral layer; whilst that which lines the interior of the chest is called the *pleura costalis*, or parietal layer; while the space intervening between these two layers is called the *cavity of the pleura*. Each pleura is a closed sac, and quite independent of the other. The interspace between the pleuræ on the right and left side is termed the *mediastinum*, and contains all the viscera of the thorax excepting the lungs. The inner surface of each pleura is smooth, glistening, and moistened by a serous fluid; the outer surface is closely adherent to the surface of the lung, to the roots of the pulmonary vessels as they enter the lung, to the upper surface of the diaphragm, and to the walls of the chest. The lobes of the lungs are separated from one another by involutions or in-foldings of the visceral layer. The use of these serous sacs is much the same as that of the *peritoneum* (q.v.); each pleura retains the lung and, to a certain extent, the greater vessels in position, while it at the same time facilitates, within certain limits, the movements of those parts which are essential to the due performance of the act of respiration.

PLEU'RISY, or inflammation of the investing membrane of the lung, is one of the most serious diseases of the chest. It is very often, but by no means invariably, associated with inflammation of the *substance* of the lung, commonly known as *pneumonia* (q.v.). Pleurisy without pneumonia is much more common than pneumonia without pleurisy. When both are present, but pneumonia preponderates, the correct term for the affection is *pleuro-pneumonia*, although it is frequently spoken of simply as pneumonia, probably in consequence of the remedies being applied mainly to it, as the more important of the two elements in the compound malady.

The pleura being a serous membrane, its inflammation is attended with the same course of events as have been already described in our remarks on the two allied diseases, *pericarditis* and *peritonitis*. The inflammation is of the adhesive kind, and is accompanied by pain, and by the effusion of serum, of fibrinous exudation (the *coagulable lymph* of the older writers), or of pus, into the pleural cavity. In consequence of the anatomical relations of the pleura—one part of the membrane (the parietal) lining the firm walls of the chest, while the other part (the visceral) envelops the soft and compressible lung; and these opposed surfaces being freely movable on one another—it follows that very different effects may be produced by its inflammation. For example, the visceral layer may be glued to the parietal layer, so as to prevent all gliding movement between them, and to obliterate the pleural cavity (similarly to what often happens in *pericarditis*, q.v.); or the two surfaces which are naturally in contact, may be abnormally separated by an infusion of serum between them; or from a combination of these results, the opposite surfaces of the pleuræ may be abnormally united at some points, and abnormally separated at others.

The general symptoms of pleurisy are rigors, pain in the side, fever, difficulty and rapidity of breathing, cough, and an impossibility of assuming certain positions; and of these the most marked is the pain or *stitch in the side*, the *point de côté* of the French writers. From the prominence of this pain, which occupies a single spot, and is of a sharp, stabbing character, the Latin writers term pleurisy *morbus lateris*. This spot is usually about the center of the mamma of the affected side, or just below it; but why the pain should be usually restricted to that one small spot, when the inflammation pervades a considerable extent of surface, is a question that has never received any satisfactory answer. The pain is, however, occasionally felt in other parts—as in the shoulders, in the hollow of the armpit, beneath the collar-bone, along the breast-bone, etc. Cruveilhier observes that the pain sometimes affects the loins, and simulates lumbago; while Andral and Dr. Watson have directed attention to the fact that the pain often affects the hypochondrium, and may be readily mistaken for a sympton of peritonitis, or (if occurring on the right side) of hepatitis. The pain is increased by percus-

sion, by pressure between the ribs, by a deep inspiration, by cough, etc.; and the patient is often observed to suppress a natural desire to cough, or never to draw more than a short and imperfect inspiration. The cough is not invariably present, although it is an ordinary symptom. It is small, suppressed as far as possible by the patient, and is either dry, or accompanied by the expectoration of slight catarrh. If much frothy mucus is brought up, it is a sign that bronchitis (q.v.) is also present, and the appearance of rust-colored sputa indicates the co-existence of pneumonia. Although the above-named symptoms, especially when most of them occur together, afford almost certain evidence of the existence of pleurisy, yet to the physician the physical signs are still more valuable, especially those furnished by percussion and auscultation.

Pleurisy far more commonly arises from exposure to cold than from any other cause, especially if a poisoned condition of the blood, predisposing to inflammation of the serous membrane, is present; but it may be occasioned by mechanical violence (as by a penetrating wound of the thorax by the splintered ends of a broken rib, etc.), or by the accidental extension of disease from adjacent parts. The disease may terminate in resolution and complete recovery; or in adhesion, which often only causes slight embarrassment of breathing: or it may end with such a retraction of one side of the chest as to render the corresponding lung almost or totally useless: or it may cause death either directly by actual suffocation, if the effusion is very copious, and is not removed by tapping; or indirectly, by exhaustion. It is seldom, however, that simple pleurisy proves fatal.

In acute pleurisy, occurring in a robust and previously healthy subject, free blood-letting should be at once resorted to. If there is a sharp stitch in the side, and the respiration is short, quick, and restrained, the patient should be bled, in the upright position, from a large orifice in the vein, until the pain is relieved, and he can draw a full breath without discomfort, or until he is about to faint; and if the pain and difficult breathing should return, and the pulse continue firm and hard, either the venesection must be repeated, or leeches must be freely applied to the painful side. The bowels should be freely evacuated, after which calomel should be given, guarded with a little opium, to the extent of producing *slight* mercurialization, with the view of checking the effusion of fluid. The more rapidly the system can be thus affected, the better, and hence it has been recommended (by Dr. Walsh) that during the first six hours a grain and a half of calomel, combined with a sixth of a grain of opium (or more, if the pain continues acute), should be given every half-hour; while mercurial ointment is rubbed into the skin of the affected side, near the arm-pit, every fourth hour. Care must be taken that neither decided salivation nor narcotism is induced; and as soon as there is any evidence from the breath, or from the appearance of the gums, that the mercurial action has been established, the further administration of the calomel and the ointment must be suspended. After the pain and fever have ceased, we must facilitate the absorption of the fluid by diuretics. A pill composed of half a grain of digitalis, a grain of squills, and three grains of blue pill taken twice a day, usually acts efficiently; and the compound tincture of iodine of the London (*not* the British) Pharmacopœia, in doses of twenty minims, taken, largely diluted, three times a day, has been strongly recommended.

There has been considerable discussion of late years as to how far the operation of tapping the chest, and letting out the fluid, is justifiable in this disease. The best authorities are of opinion that in simple pleurisy it ought never to be performed unless (1) the life of the patient is in immediate danger from the continued pressure of the fluid in the sack; (2) unless all other means of getting rid of the fluid having failed, the patient is evidently losing strength daily; and (3) unless there is good reason to believe that the fluid consists of pus, in which case it should be let out. In all cases in which the operation is contemplated, a grooved needle should be introduced into the pleura. By this means, we not only ascertain the actual presence of fluid, but we discover its nature. If it be serious, it will flow readily along the groove, and trickle down the patient's side; if it be purulent and thick, a drop or two will probably be visible at the external orifice, and when the needle is withdrawn, its groove will be found to contain pus. The puncture thus made is quite harmless, and inflicts very little pain.

PLEURISY-ROOT. See Butterfly Weed.

PLEURODY'NIA is a rheumatic affection of the intercostal muscles, and is characterized by acute pain in the side upon taking a full breath or coughing, and by great tenderness on pressure. If it happens to be attended by slight febrile excitement, or by a cough, it is impossible to distinguish it from pleurisy, except by attending to the physical signs which characterize the latter disease. Cruveilhier maintains that "pleurodynia is nothing more than adhesive pleurisy;" and in many cases of assumed pleurodynia, there is little doubt that the pain is due to old adhesions. The disease generally yields to local measures, such as blistering, or counter-irritation in a milder form by rubefacient liniments. A mixture of soap-liniment and chloroform rubbed over the affected part two or three times a day, often gives relief. In the more persistent cases, leeches may be applied with benefit.

PLEURONECTIDÆ, a family of fishes included in Cuvier's *malacopterygii*, but belonging to the order *anacanthini* of Müller's system (see Malacopterygii), and remarkable for a character to which there is nothing similar in any other vertebrate animals, a want of symmetry in the head, and for swimming not with the back uppermost, like other

fishes, but with one side upppermost. The peculiar structure of the head adapts it to this mode of swimming, both eyes being on that side which is uppermost. Some of the bones of the head are distorted to a very considerable degree, but there is no want of symmetry in those of the body. The sides of the mouth are unequal. The body is extremely compressed, whence the pleuronectidæ are popularly termed *flat fish*, the back and belly being mere edges fringed by the dorsal and anal fins. The pectoral fins are generally unequal, also the ventral fins, those of the lower side being smaller than those of the upper. The upper side is often brown, or of some darkish color, and variously marked; the lower side whitish. The color of the upper side generally corresponds so much with that of the bottom, close to which these fishes swim, that they readily escape observation; and on this they seem chiefly to depend for safety, although, when hard pressed, they raise themselves in a vertical position, and suddenly throw themselves upward and forward to some distance, but then resume their ordinary posture, and as close to the bottom as possible. Their ordinary swimming is by a kind of undulating movement. They swim with great activity. They have no air-bladder. They abound chiefly where the bottom is smooth, either muddy or sandy. All of them are sea-fishes, but some are very common in brackish water, ascend rivers, and can be kept in fresh-water ponds. Many of them are in great esteem for the table. The turbot, halibut, brill, plaice, and flounder are examples of this family.

PLEU'RO-PNEUMO'NIA, in an epizootic form, first appeared amongst the horned cattle of Great Britain and Ireland in 1841. From time immemorial it had, however, been known in the great cattle-breeding plains of central and northern Europe. It consists in a sub-acute inflammation of the structure of the lungs and their investing membrane, shows a great tendency to early exudation, and is accompanied by low fever. It is contagious, but, like many other contagious disorders, it occasionally occurs independently of contagion, and is fostered by overcrowding, exposure to cold and wet, damp, dirty hovels, and other such causes, which depress the vital powers. The symptoms come on insidiously, appetite and rumination are irregular, there is fever, dullness, a short, half-involuntary cough, with quickened breathing and pulse. In cows, the yield of milk is early diminished. After three or four days, large portions of the lungs become filled with the products of inflammation, hence the labored breathing, quick indistinct pulse, wasting, and fatal weakness. Death generally occurs in from ten to twenty days. When pleuro-pneumonia first appeared in this country, it was greatly more fatal than it has since become, and fully four-fifths of the cattle attacked died; with prompt and rational treatment, more than one-half of the affected cases now recover. But as a favorable result is uncertain, and much flesh is lost even during a slight attack, it is still advisable, when pleuro-pneumonia breaks out in a herd, to consign to the shambles any of the cattle in good condition that have mixed with those diseased. The best treatment consists in avoiding bleeding and all reducing remedies, supporting the strength, and keeping up the action of the skin, bowels, and kidneys, in order that the poisonous products of the disease may be rapidly got rid of. For this end, the patient should be provided with a cool comfortable house, clothing to the body, bandages to the legs, a daily dose of two ounces each of niter and common salt given in treacle and water. When the bowels are costive, gentle laxatives are required. By the second or third day, counter-irritants may be applied to one or both sides, which should first be bathed with hot water and thin mustard paste, or a mixture of cantharides and euphorbium ointments well rubbed in. By the third or fourth day, or earlier, if there is weakness, arrested secretion, and coldness of the skin, give several times daily some stimulant, such as a quart of warm ale, with an ounce or two of ginger or other stomachic, some good whisky-toddy, three-ounce doses of sweet spirit of niter, or of spirit of ammonia. Whilst the disease continues, and even during early convalescence, all food requiring rumination must be interdicted, and mashes, flour and treacle, bruised grain, or any light digestible articles substituted for the ordinary hay, straw, or roots. As pleuro-pneumonia is in many cases propagated by contagion, the sick should be separated from the sound stock; and any premises they have occupied carefully cleansed by whitewashing, and the use of McDougall's, Condy's, or other effectual disinfectants. When pleuro-pneumonia prevails in a neighborhood, all fresh purchases should be placed in quarantine, and kept perfectly away from the home-stock for at least three weeks. Attention to this simple precaution has preserved many farmers from pleuro-pneumonia, even while it has raged all around them.

PLEURO-PNEUMONIA. Prof. James Law, of Cornell university, in a recent work gives much valuable information on the pleuro-pneumonia of cattle, or, as he thinks it should be called, contagious lung plague of cattle, which answers to the German name *lungenseuche* (lung contagion). He gives as a definition of the malady, a specific contagious disease, peculiar to cattle, and manifested by a long period of incubation—ten days to three months—by a slow, insidious onset, by a low type of fever, and by the occurrence of inflammation in the air passages, lungs, and their coverings, with an extensive exudation into the lungs and pleuræ. He says that the nature of the disease has been misapprehended by many authorities, especially among English veterinarians, and that there is no proof that, like other inflammations of the organs within the chest, it is caused by exposure, inclement weather, changes of climate and

season, imperfect ventilation, overcrowding, etc. He says that the malady "is always and only the result of contagion or infection," therefore he proposes the name above given. He has, however, no objection to the old name, *pulmonary murrain.* After giving an account of the disease as it has appeared on the eastern continent, in which he makes the statement that Great Britain alone has, since 1842, lost not less than $10,000,000 per annum by the ravages of the disease, he gives a brief notice of its introduction into the United States. It was brought into Brooklyn in 1843, by means of a ship cow, bought by Peter Dunn of the capt. of an English vessel. From this cow it spread rapidly over the whole w. end of Long Island. The plague was introduced into Massachusetts in 1859, by four Dutch cows, imported by Mr. Chenery, of Belmont, near Boston. They were brought from the infected port of Rotterdam, and were forty-seven days at sea, during the last twenty of which they were sick, one of them being unable to stand. On landing, two walked to the farm, while the other two had to be carried. One recovered, and three died, the last one the 10th of June. On August 20, another cow of the herd took the disease and died in a few days. Several others followed in rapid succession. Then Mr. Chenery became convinced that he was dealing with the bovine plague of Europe. He had unfortunately sold some calves to a neighbor on the 23d of June. The disease spread, and during the next four years infected many counties. In 1860 a state act was passed to provide for the extirpation of the disease, which empowered the commissioners to cause all cattle in herds where the disease was known or suspected to exist to be killed. The commission was kept in existence six years, when the last member resigned, the disease having been exterminated. The malady was imported into New Jersey in 1847, by Mr. Richardson, who, as soon as he ascertained the fact, had his whole herd, valued at $10,000, slaughtered. But others who had diseased cattle were not so public-spirited, and the pest was carried into Pennsylvania and Delaware, spreading into Maryland and Virginia, where it prevailed for years. The disease is communicated by immediate contact, through the atmosphere for a considerable distance, by the inhalation of pulmonary exudation when placed in the nostrils, from the impregnated clothing of attendants, infected buildings, infected manure, pastures, fodder, etc. Pastures grazed three months previously have communicated the infection, and it has been spread by the flesh of diseased animals. In buildings which contain piles of lumber, litter, and hay, the virus may be preserved some considerable time. The distance through which the infection will pass between separated cattle varies. Herds separated not more than 15 yards, with a tight board fence 7 ft. high between them, have been known to be unaffected for over six months, while the infection has been conveyed much greater distances. The disease is confined to the bovine genus, and all its members, irrespective of age or sex, appear to be equally liable to its attacks, and, as in many other contagious diseases, those animals which have once had the disease are exempt from future attacks. The period of incubation is variable, ranging, according to authorities, from five days to three months; and it is this insidiousness which renders the disease so dangerous. It, however, develops much more rapidly in hot than in cool weather, and in the s. than in the north. The work of exterminating the disease in New York by Gen. Patrick and Prof. Law was, at the commencement of 1880, as follows . In the preceding ten months the inspectors in New York had examined 40,000 head of cattle, many of them several times. They had paid the owners for 500 head of slaughtered cattle, which nearly eradicated the disease from seven counties. At that time the center of the plague was in Kings co., and the adjacent border of Queens county. In all the country districts where the cattle were kept on inclosed farms, the work of exterminating the disease was comparatively easy. In the suburbs of cities, where cattle were allowed to graze on open lots, the greatest difficulties were met. More difficulty was found in Brooklyn than in New York, because of the greater opposition to the work of the inspectors. In Putnam co., where the disease had been smoldering for more than a year, the county authorities authorized the extermination of every herd known to be infected.

PLEXIM'ETER. See PERCUSSION.

PLEYEL, IGNAZ JOSEPH, a musical composer of some note, b. in 1757, at Rupperstahl, near Vienna. He studied music under Vanhall and Haydn, and made in early life an extensive tour in Italy, to hear the works of the best composers. In 1783 he was made *capellmeister* of Strasburg cathedral, and during the succeeding ten years composed most of the works on which his popularity rests. In 1791 he visited London, and composed there three symphonies. Two years afterward, during the frenzy of the French revolution, he fell under suspicion, and in proof of his acquiescence in the new order of things, had to compose a musical drama for the anniversary of the 10th of August, which saved his life. After a long career in Paris as a publisher of music and pianoforte manufacturer he retired to an estate which he had purchased near Paris, and died in 1831. His compositions, consisting of quartettes, concertantes, and sonatas, are full of agreeable melodies, sometimes light and trivial, but occasionally vigorous.

PLICA POLONICA is the name given to a disease of the scalp, in which the hairs become matted together, by an adhesive and often fetid secretion, and which is especially prevalent in Poland, although it occasionally occurs in other countries. The hair is found, on microscopic investigation, to be infested with a fungus of the genus *trichophyton.*

The only treatment that is beneficial is the removal of the hair, and strict attention to cleanliness; but, as it is popularly believed in Poland that this affection affords a security from all other sickness and misfortune, it is often difficult to persuade patients to have recourse to these means. For an account of the parasitic fungus that attacks the hair in this disease, and of the changes of structure which it induces, see Küchenmeister's *Manual of Parasites*, vol. ii. pp. 148–152.

PLINLIMMON, or PLYNLIMMON, a mountain of Wales, on the boundary between the counties of Montgomery and Cardigan, 13 m. e.n.e. of Aberystwith. It is 2,481 ft. in height. The name Plinlimmon is said to be a corruption of the Celtic *pumlumon*, signifying five rivers, and to be due to the fact that five rivers have their source in this mountain: one of them is the Severn, and another the Wye. Plinlimmon is a huge mountain mass with three chief summits. Although not above 12 m. from the coast, it is in the midst of a wild waste of muir and bog. Spurs or subordinate mountain-ranges spread out from it in all directions. The view from the summit is very extensive. It was in the fastnesses of Plinlimmon that Owen Glendower took his stand, in 1401, at the outset of his career, issuing thence with a few determined followers to make inroads on the English borders.

PLINTH, the square member at the bottom of the base of a column. Also the plain projecting band forming a base of a wall.

PLINY, or C. PLINIUS SECUNDUS, often called Pliny the elder, and author of the celebrated *Historia Naturalis*, was b. in the n. of Italy, either at Novum Comum (*Como*) or Verona, 23 A.D. Whether it was his birthplace or not the former town was certainly his family's place of residence, since he had estates in its neighborhood; his nephew, the younger Pliny, was born there, and inscriptions relating to members of his family have been found near it. While still young he was sent to Rome, where his ample means and high connections secured him the best education. At the age of 23 he entered the army, and served in Germany as commander of a troop of cavalry under L. Pomponius Secundus, of whom, in later life, he wrote a memoir. He traveled over nearly all the frontier of that extensive province, visited the Cauci and the sources of the Danube, composed during the intervals of military duty his treatise *De Jaculatione Equestri*, and commenced a history (afterward completed in twenty books) of the Germanic wars. On his return to Rome in 52 with Pomponius, he entered on the study of jurisprudence; but his practice as a pleader proved him to have no great capacity for the legal profession; and, accordingly, he retired to his native place, where he spent the greater part of the reign of Nero in miscellaneous authorship. It was during this period that he wrote his *Studiosus*, a treatise in three books on the training of a young orator from the nursery to his entrance on public life, and apparently intended to guide the education of his nephew; also his grammatical work, *Dubius Sermo*, in eight books. Shortly before Nero's death we find him a procurator in Spain, where, in 71, he heard of his brother-in-law's decease, and of his being intrusted with the guardianship of his nephew, Pliny the younger, whom he adopted on his return to Rome before 73. Vespasian, the reigning emperor, whom he had known while serving in Germany, received him as one of his most intimate friends; and it was at this period that he completed, in 31 books, and brought down to his own time the Roman history of Aufidius Bassus. His mode of study at this time was a model of systematic assiduity. When living in the busy world of Rome, he would begin his studies by candle-light in autumn at a late hour of the night, and in winter at one or two in the morning. Before daybreak he would call on the emperor, for whom he would proceed to execute various commissions; this done he would return home and resume his studies. A slender meal would follow; after which he would, in summer weather, lie in the sunshine, and take notes or extracts from the books which were read to him. The practice of jotting down important facts or observations was habitual with him, and he was often heard to say that there was no book, however bad, from which some good could not be got. A cold bath, followed by a light meal and a short sleep occupied another interval, after which he would study till the *cœna*, or dinner-time. Even at this meal some book was read to him on which he would make comments. When in his country residence he studied nearly all the time, except when in the bath; and even then, while his attendants were performing the duties incident to that luxury, he would be listening to some one who read to him, or he would be dictating to his amenuensis. When on a journey, again, he was never without a secretary at his elbow, provided with a book and tablets. By this mode of life he collected an immense mass of materials, from which he compiled his great *Historia Naturalis*, published about 77. No fewer than 160 *volumina* of notes were found at his death, two years afterward. The great eruption which, in 79, submerged Herculaneum and Pompeii was at its height when he was stationed off Misenum, in command of the Roman fleet. Eager to examine the phenomenon more closely, he landed at Stabiæ, where he was suffocated by the vapors caused by the eruption. He was, as his nephew tells us, corpulent and asthmatic, and sank the more readily. None of his attendants shared his fate.

Of all his works, only his *Historia Naturalis* has come down to us. It comprehends a greater variety of subjects than we now regard as included under that title. Astron-

omy, meteorology, geography, mineralogy, zoology, botany, everything, in short, which is a natural or non-artificial product, finds a place in Pliny's Natural History. Even to this elastic interpretation of the term he by no means rigidly adheres, the work being interspersed with digressions on such subjects as human institutions and inventions, and the history of the fine arts. It is divided into 37 books—the first of them being a dedicatory epistle to Titus, with a table of contents of the remaining books, and embraces, as we are told in the preface, 20,000 matters of importance, extracted from about 2,000 volumes. Its scientific merit is not great. There is little attempt at philosophical arrangement; the observations are nearly all taken at second-hand, and show small discrimination in separating the true from the false, or the probable from the marvelous. His meaning is often obscure, from his writing of things with which he was personally unacquainted, and from his having missed the true sense of the authors whom he cites or translates. But it cannot be denied that the work is a great monument of industry and research—most praiseworthy as having been constructed and completed amid the labor of other onerous undertakings, and amid the distractions of a life engaged in an active official employment; and most valuable as supplying us with details on a great variety of subjects, as to which we have no other means of information. The best critical editions of the text are those of Sillig (8 vols., 1851–57), Ian (1854–63; new ed., 1875), and Detlefsen (1867–75). There are several editions of the text with French notes, one by Grandsagne, with notes by Cuvier and others (1829), and one by Littré (1848–50). Pliny's work has been translated into almost all European languages.

PLINY, or C. Plinius Cæcilius Secundus, nephew of the preceding, and son of C. Cæcilius, frequently called Pliny the younger, was born at Novum Comum, 62 A.D. He was still young when he lost his father, and was adopted by his uncle, under whose care, and that of his mother, Plinia, and his tutor, Virginius Rufus, his education was prosecuted. Passionately devoted to literature, he wrote a Greek tragedy at the age of 13; studied eloquence under Quintilian, and became so famous for his literary accomplishments that he acquired the reputation of being one of the most learned men of the age. His oratorical powers were also considerable; in his 19th year he began to speak in the forum, and his services as an advocate before the court of the centumviri and the Roman senate were in frequent request. He held numerous official appointments; served, while a young man, as *tribunus militum* in Syria, where he listened to the teaching of Euphrates the stoic, and Artemidorus; was afterwards *quæstor Cæsaris;* was prætor about 93, and consul in 100, when he wrote his *Panegyricus*, an adulatory eulogium of the emperor Trajan, and containing little information as to the author and his times. He was appointed, in 103, proprætor of the province Pontica, an office which he vacated in less than two years; and he also discharged the function of curator of the banks and channel of the Tiber. He was twice married, his second wife being Calpurnia, granddaughter of Calpurnius Fabatus, and considerably younger than her husband, by whom she was much beloved for her accomplishments and amiability. He had no issue by either marriage.

Our knowledge of Pliny the younger is mainly derived from his letters or *Epistolæ*, of which there are 10 books. He collected them himself, and probably wrote many of them with a view to publication. They hold a high place in epistolary literature, and give us many interesting glimpses into the life of their author and his contemporaries. Pliny himself appears in them to considerable advantage, as a genial and philanthropic man, enamored of literary studies, and fond of improving his estates by architectural ornament. His ample fortune was liberally bestowed, and his slaves always found in him an indulgent master. Infirm health impaired throughout life his constitution, which was naturally weak; but of the time or cause of his death we know nothing. Of the facts contained in his letters, however, the most interesting to us are those relating to the punishment of the Christians. Death appears to have been the penalty attached even to the confession of being a Christian; although the adherents of the faith admitted no other acts, on examination, than those of meeting on a fixed day before dawn, when a hymn to Christ was sung, and taking an oath to avoid theft, adultery, breach of faith, and denial of a deposit. Nothing more unfavorable to them than this could be extorted by Pliny from two female slaves, reputed to be deaconesses, whom he put to the torture. Pliny having asked Trajan how he was to stop the spreading superstition, the emperor replied that no general rule could be laid down; that he ought not to institute a search after persons supposed to be Christians; but if any were brought before him, and the charge was proved, such were to be punished, if still impenitent. The best editions of Pliny's *Panegyricus* and *Epistolæ* together is that of Schaefer (1805), and Keil (1870); of the *Epistolæ* alone, that of Gierig (1806).

PLIOCENE (Gr. more recent), the name given by sir Charles Lyell to a section of the upper tertiaries, because the organic remains found in it contain between 60 and 70 per cent of living species; a greater proportion than exists in the older miocene, but not so great as that found in the succeeding pleistocene.

The beds belonging to this period are very local. They have been noticed in several places in Europe, but have been chiefly studied in Suffolk, the only locality in which they occur in Britain. Here they cover the upper beds of the London clay; and being composed of shelly sand, they have, like similar deposits, been used for fertilizing lands

deficient in calcareous matter, and have received the local name of "crag." They are divided into the (1) red crag, 50 ft.; (2) coralline crag, 50 ft.

The red crag consists of beds of quartzose sands and gravel with a mixture of shells, for the most part rolled, and sometimes broken up into sand. The whole deposit, with the contained fossils, has a deep ferruginous or ocherous color. It seems to have been formed in shallow water, the currents of which have given it a very variable character, and frequently confused the stratification, as in some modern sandbanks. The fossils have a somewhat boreal character. They consist chiefly of mollusca; but there have been also found the bones and teeth of large sharks, skates, and other fish, and the earbones of one or more true whales.

The coralline crag is generally calcareous and marly, consisting of a mass of shells and polyzoa, separated in some places by thin layers of hard limestone, and coral-like masses, which occupy the position in which they lived. It is easily separated from the red crag by its white color. It has been formed at a greater depth and in more tranquil water than the newer deposit. The fossils have a more southern facies than those of the red crag, and indicate that they lived in an ocean with a higher temperature. Among these southern forms may be mentioned species of the genera conus, oliva, mitra, voluta, and pyrula. The calcareous polyzoa are abundant and very beautiful; and several interesting forms of echini have been described. A few fossils of the same species as those occurring in the London clay have been found in this and the red crag, but these are believed to have been washed out of the inferior deposits.

Mr. Searles Wood has obtained 345 species of testacea from the coralline crag, and 230 from the red crag, of which about 150 are common to both; about 70 per cent of the newer division are also recent, and about 60 per cent of the older.

Pliocene deposits have been observed in the neighborhood of Antwerp and on the banks of the Scheldt, from which 200 species of shells have been obtained, two-thirds of which were already known from Suffolk. More than a half are recent species found in the northern seas, and a few are still living in the Mediterranean. Similar deposits occur in Normandy. The low hills between the Apennines and the sea on each side of Italy are formed to a considerable extent of beds belonging to this period; and the marine strata of the seven hills of Rome are of the same age. Beds of a brackish-water origin, observed on the shores of the Caspian, Aral, Azof, and Black seas, have been referred to this period.

PLIOSAU'RUS (Gr. literally "more a lizard," i.e., than the *plesiosaurus*), a genus of fossil sea-reptiles nearly allied to the plesiosaurus, but having a very short neck, and comparatively a larger head. The jaws also are furnished with stronger teeth, which are subtrihedral in cross section, with one side flattened, and bounded by prominent lateral ridges on the more convex sides. Three species have been described. They are peculiar to the Oxford and Kimmeridge clays of the upper oolite period.

PLOCA'RIA, a genus of *algæ*, of the order or suborder *ceramiaceæ*, having a cartilaginous frond, composed of large cells, as if jointed, and dividing into slender, tufted, and densely aggregated branches. *P. helminthochorton* is the Corsican Moss of the apothecaries' shops, once of some reputation as a vermifuge, but now little used, and believed to be of little efficacy. It is a small plant with a filiform entangled frond, and grows on the shores of the Mediterranean. It has a strong marine odor and a salt taste. It consists in great part of a vegetable jelly or mucilage, which renders it nutritious, and contains much chloride of sodium, sulphate of lime, and carbonate of lime. As sold in the shops, it is always much mixed with other algæ.—*P. tenax* is a small plant with filiform, branched, and somewhat gelatinous frond, much used by the Chinese as a glue. It is also used in China as an article of food.—*P. candida* is used to a considerable extent as an article of food in the east. It is popularly called Ceylon Moss. The frond is whitish and much branched, the branches long and somewhat clustered. It is exported to China from the islands of the Indian archipelago, forming a portion of the cargo of almost every junk. The Chinese make it into a jelly with sugar, and use it as a sweetmeat. It consists in great part of a vegetable jelly, with a considerable quantity of starch. It has been introduced into Britain as a light and nourishing food for children and invalids, and is found particularly suitable in cases of irritation of the mucous surfaces.

PLOCE'US. See Weaver Bird.

PLOCK (Russ. Plotzk), a government in the n.w. of Poland, bounded on the n. by Prussia, and on the s.w. by Warsaw. Area, 4200 sq. m.; pop. '91, 660,457, of whom 80 per cent. are Poles. Hills occur in the n. and on the banks of the Narew and Vistula, which with the Bug are the chief rivers. One-third of the surface is covered with forests, and there are many marshes and lakes. The inhabitants are engaged chiefly in agriculture, and in cattle and sheep breeding.

PLOCK (Russ. Plotzk), a t. of Poland, capital of the government of the same name, occupies an elevation on the right bank of the river Vistula, 59 m. w.n.w. of Warsaw. Its principal buildings are the cathedral, built in 961, the bishop's palace, theater, etc. Agriculture, and the export of grain to Dantzic and other ports, are the chief employments. Pop. '90, 23,568.

PLOJE'SHTI, or PLOYESTI, a t. of Wallachia, Roumania, 36 m. n. of Bucharest, on the Dimbow, a feeder of the Jalomnitza. It is a place of considerable trade, and has a great annual wool-fair. Pop. '90, 34,474.

PLOMBIÈRES, a t. and watering place in the department of Vosges in France ; pop. 1750. It has for ages been celebrated for its medicinal springs of three sorts, viz., ferruginous, soapy, and thermal. The former are cold, the second tepid, the latter hot. Each possesses peculiar mineral properties. Bathers make principal use of the two latter, and the former is used to drink. Superb accommodations for those who take the baths or drink the waters were made during the reign of Louis Napoleon, in addition to all which had previously been done to make the place attractive. The waters, as drink or in baths, are considered good for the cure of dyspepsia, gout, urinary affections, paralysis, and diseases of the skin. The baths were improved by the Romans. In 1292 the duke of Lorraine built a chateau there "to defend the bathers against the bad," according to the Chronicles. Montaigne was a visitor there in 1580; in 1682 it was shaken by an earthquake; about 1722 king Stanislaus of Poland and the duke of Lorraine built the palais royal, founded a hospital there, and made beautiful promenades. Royal treasures have since flowed in constant streams to decorate the classic grounds, but most of all under the orders of Louis Napoleon, whose engineers made it one of the most admirable health resorts in the world, with all the conveniences and comforts of modern art. Among recent works on the baths are *Eaux de Plombières, clinique médicale du Rheumatisme et de son Traitement*, by L. Heritier, 1857; *Essai sur les Bains Tiède*, by Turck, 1861; and *Traités Généraux, et Guides des Eaux*, by Hutin, Bourdon, etc.

PLONGÉE, in artillery and fortification, means a slope toward the front. Thus, in speaking of the course of a shell through the air, its plongée is from the point of greatest altitude to the point at which it strikes the earth. So, in fortification, the plongée is the top of the parapet sloping gently toward the front. This slope is ordinarily 1 in 6; but a deviation is permissible of from 1 in 9 to 1 in 4: the sharper the slope, however, the more liable is the crest of the parapet to be destroyed by an enemy's fire. Moreover, as flat a plongée as possible is desirable, that sandbags may, when required, be laid upon it to form a cover for riflemen. See FORTIFICATION.

PLOTINUS, the most original and important philosopher of the Neoplatonic school, was born at Lycopolis in Egypt 205 A.D.; but such was his utter indifference to things human, "being ashamed almost to live in a body," that he never would divulge even his parentage. He would never allow his birthday to be celebrated, although he gave feasts on those of Socrates and Plato; nor would he ever permit a painter or sculptor to perpetuate his features, or, as he called it, to produce the image of an image—the body being to him only a faint image of existence. He deemed it tedious enough already to have to drag about this image whithersoever he went in this life. His body was altogether contemptible in his eyes; he would see no physician in his illness, and was very sparing in the use of food, refraining from meat, often even from bread. Strangely enough, his desire for the study of philosophy did not arise within him before his 28th year, when he repaired to Alexandria, and there, after having sat at the feet of the great masters for some time without feeling satisfied with their teachings, he at last became acquainted with Ammonius Saccas, and in him found the desired teacher. For 10 years he zealously attended his lectures, and although he had agreed, with two of his fellow-students, never to make known aught of Ammonius's teachings to the world, he yet became the chief representative and author of that school, less as a pupil than as an independent thinker, who taking his stand upon its theorems, developed them to their full extent. In 242 he joined Gordianus's expedition to Persia, in order to devote himself to the philosophy of India and Persia; but the emperor being murdered in Mesopotamia, he had to repair hurriedly to Antioch, whence, in 244, he went to Rome. His lectures here were attended not only by crowds of eager youths, but men and women of the highest circles flocked to hear him. Not only Platonic wisdom, in Neoplatonic garb, but asceticism and the charm of a purely contemplative life, were the themes on which he, in ever-new variations, and with an extraordinary depth and brilliancy, held forth; and such was the impression his earnestness made upon his hearers, that several of them really gave up their fortunes to the poor, set their slaves free, and devoted themselves to a life of study and ascetic piety. Dying parents intrusted their children and money to him, well knowing that an honester guardian, and one more anxious for his charges, could not be found. It is hardly surprising to find that his contemporaries coupled with his rare virtues the gift of working miracles. Sixty years old, he thought of realizing Plato's dream, by founding an aristocratical and communistic commonwealth like the latter's "republic;" and the emperor Gallienus was ready to grant the site of two cities in Campania for his "Platonopolis;" but his courtiers prevented the fulfillment of this promise. Plotinus died from a complication of diseases, in 270, at Puteoli, 66 years of age.

Although he began to write very late in life, he yet left 54 books of very different size and contents. His MS. being very carelessly written, he asked his pupil Porphyry to revise and correct it for him. The latter also divided it into six principal divisions, each subdivided again into nine books or *enneads*. The most important parts are those which treat of beauty, fate, immortality of soul, the good, or one, the three original substances, of free will, against gnostics, of providence, of the genesis of ideas, of the influ-

ence of the stars, of the supreme good, etc. The language is very unequal in the different portions, according to the mood and circumstances to which they individually owe their existence; but it always is original, compact, and graphic in the extreme.

Plotinus's system was based chiefly on Plato's theorem of the ideas; only that while Plato assumed the ideas to be the link between the visible and the invisible, or between the supreme Deity and the world, Plotinus held the doctrine of emanation, that is, the constant transmission of powers from the absolute to the creation, through several agencies, the first of which is "pure intelligence," whence flows the "soul of the world," whence, again, the souls of "men" and "animals," and finally "matter" itself. (For a fuller account of this part of Plotinus's system in its historical connection, see NEO-PLATONISTS.) Men thus belong to two worlds, that of the senses and that of pure intelligence. It depends upon ourselves, however, to which of the two worlds we direct our thoughts most and belong to finally. The ordinary virtues, as justice, moderation, valor, and the like, are only the beginning and very first preparation to our elevation into the spiritual realm; purification, or the exercise of *purifying* virtues, is a further step, to which we attain partly through mathematics and dialectic; and the abandonment of all earthly interests for those of intellectual meditation is the nearest approach to the goal. The higher our soul rises in this sphere of intellect, the deeper it sinks into the ocean of the good and the pure, until at last its union with God is complete, and it is no longer thought but vision and ecstasies which pervade it. These are a few snatches of Plotinus's philosophical rhapsodies, to which may be further added his mysterious belief in a kind of metempsychosis, by which souls, not sufficiently purified during life, return after death, and inhabit, according to their bent, men, animals, and even plants. He further held views of his own respecting gods and demons, whom he divided into different classes, according to their degrees; and professed faith in mantic, astrology, and magic, the conviction of the truth of which sciences he derived from his theory of the harmony in the intellectual world reflected by the material world. Yet it is clear from his dicta on these subjects that he did not believe in these so-called sciences in the gross sense of the herd, but that he had a vague knowledge of those mysterious laws of attraction and repulsion which go through nature. Plotinus's philosophy, which, as it were, tried to combine all the systems of Anaxagoras, Parmenides, the Pythagoreans, Plato, and Socrates, and the Stoa into one, was the last and boldest attempt of the ancient Greek world to explain the mystery of the creation and of existence. Its influence upon modern philosophy is remarkable. From Spinoza to Schelling, the reminiscences of Plotinus, irrespective of the drift of particular parts of their systems, recur constantly.

Plotinus's works were well-nigh forgotten, when Marsilius Ficinus first published a Latin paraphrase of them (Florence, 1492), which was followed by the *Ed. Pr.* of the original (Basel, 1580 and 1615). The first critical edition, however, is due to Creuzer (Oxford, 1835, 3 vols.). Others are those of Dübner (Paris, 1855) and Kirchhoff (1856). Parts of his works were translated into German by Engelhard (1820); into English by Taylor (1794 and 1817); into French by Bouillet (1861, 3 vols.). See Kirchner, *Die Philosophie des Plotinus* (1854); and H. von Kleist, *Plotinische Studien* (1883).

PLOTUS. See DARTER.

PLOVER, *Charadrius*, a genus of birds of the family *charadriadæ* (q.v.), having a straight compressed bill; the upper mandible alone slightly inflated and slightly bent at the point; the nasal groove extending about two-thirds of the length of the bill, the nostrils longitudinally cleft near the base; the legs not very long, naked a little above the tarsal joint; no hinder toe; the wings rather long and pointed, the first quill-feather the longest. The species are numerous, and are found in every quarter of the globe; many of them are birds of passage. They chiefly frequent low moist grounds, where they congregate in large flocks, and feed on worms, mollusks, insects, etc.; but some of them visit mountainous regions in the breeding-season. They fly with great strength and rapidity, and run with much swiftness. The flesh and eggs of many of them are esteemed delicacies. One of the British species is the dotterel (q.v.). Another is the GOLDEN or YELLOW PLOVER (*C. pluvialis*), a rather larger bird, of a blackish color, speckled with yellow at the tips and edges of the feathers; the throat, breast, and belly black in summer, whitish in winter. The golden plover is a bird of passage, visiting, in summer, the northern parts of Europe, of the west of Asia, and of North America; and migrating to the south in winter. It is known in almost all parts of Europe, and is common in many parts of Britain, breeding in the northern parts. Great numbers frequent the sandy pastures and shores of the Hebrides and of the Orkney and Shetland islands. It makes an artless nest, little more than a slight depression of the ground, and lays four eggs. The parent birds show great anxiety for the protection of their young, and use various stratagems to divert the attention of an enemy. The golden plover exhibits great restlessness on the approach of wet and stormy weather, whence its specific name *pluvialis*.—The RINGED PLOVER (*C. hiaticula*), a much smaller bird, not so large as a song-thrush, is found at almost all seasons on the shores of the British islands, frequenting sandy and shingly flats, from which the sea retires at ebb-tide. It is often to be seen also on the banks of large rivers, and not unfrequently of lakes and ponds. It is found in most of the northern parts of Europe and Asia, and in Iceland and Greenland. It is grayish-brown above, whitish beneath, with a collar of white round the neck, and

below it a black—in winter, a brown—collar; the head marked with black and white; a white bar on the wing. Very similar, but smaller, is the KENTISH PLOVER (*C. cantianus*); and also similar and of similar habits is the smallest of the British species, the LITTLE RINGED PLOVER (*C. minor*). Both of these are rare in Britain.—North America has a number of species of plover, one of which, the AMERICAN GOLDEN PLOVER (*C. Virginiacus*), very closely resembles the golden plover of Europe; and another, the KILDEER PLOVER (*C. vociferus*), abundant on the great western prairies, and not unfrequent in the Atlantic states, utters, when approached by man, a querulous or plaintive cry, like the lapwing.—The name plover is often extended to species of *charadriadæ* belonging to other genera, as *squatarola*, in which the nasal grooves are short, the tip of the bill is tumid, and there is a rudimentary hind-toe. To this genus belongs the GRAY PLOVER (*S. cinerea*) of Britain, a species rather larger than the golden plover, and chiefly known as a winter visitant. Its geographic distribution extends over most of the northern parts of the world.

PLOW, PLOWING. The first in order and importance of agricultural operations is the breaking up of the soil, and this is accomplished, in all countries where agriculture is in an advanced state, by inverting the upper stratum of earth upon which the plants grow. Such a mode also buries and destroys all weeds, leaving the surface clean and unencumbered. The inversion of the upper stratum is effected by turning over successive sods or slices, of the length of the field, and of varying thickness and depth, according to the nature of the succeeding crop, and the nature of the soil; and the implement employed for this purpose is the *plow*. The general form of the plow is known to every one, and to the unobservant eye it appears to be a very simple and even primitive tool; nevertheless, much mechanical skill and ingenuity have been expended in perfectly adapting it to its work. It is a combination of instruments (fig. 1) fastened to a beam, GBL; the *coulter*, K, is an iron knife-blade for cutting the sod vertically; the *share*, CFD, which is merely a socket fitted on and not fastened to the body of the plow, has a sharp point, C, and a projecting horizontal edge, CO, on its right-hand side, its part of the work being to separate the under-surface of the sod from the subsoil; by means of the *mold-board*, H, the slice, now wholly separated from the firm ground, is raised up and turned over by the forward motion of the plow; and the *stilts*, or handles, one of which, BL, is a continuation of the beam, the other, M, being fastened partly to the former by rods, and partly to the lower portion of the framework, are for the purpose of guiding the implement. The front part of the beam is formed with an upward curve; at its extremity is placed the *bridle*, N, to which the horses are attached by means of swing-trees and chains or traces, and the object of which is to enable the workman to elevate or depress the line of draught, or move it to the right hand or the left, as may be found necessary. The left sides of the coulter, share, and framework, ADEB, should evidently be in the same vertical plane. The form of the mold-board is of the utmost importance, and has chiefly attracted the attention of agricultural machinists since the time when improvements on the plow were first projected. Its office being to raise and turn the sod, it is necessary that the surface should slope upward and outward from the front, so as to apply a pressure in both directions, and, accordingly, the surface is so shaped that from the point of the share, where it is horizontal, it gradually curves upward, till, at the extremity, P, it inclines over away from the body of the plow. The gradual change produced on the position of the furrow-slice is seen in fig. 2, where ABCD, on the left-hand side, represents the slice untouched by the plow, AD being the line of section by the coulter; DC, by the share; BC, the open side from which the previous furrow (E) to the right-hand side has been separated; and the four successive rectangles, ABCD to the right, illustrate the successive changes of position of the furrow as the mold-board is pushed forward under and on its left side, till it is finally left, as represented in ABCD, on the right hand; E, F, G are furrows which have previously been laid in their proper position. The advantages of laying the furrows in the position shown are these: in the first place, the weedy side of each furrow being closely applied to the previous furrow, and kept pressed against it by its own weight and the pressure of the mold-board, the weeds are completely buried; secondly, the ridged surface thus presented affords the means of covering the seed by harrowing; and lastly, the openings below increase the amount of surface accessible to air, and drain off superfluous water. The modern plow is wholly formed of iron; the share and the framework of malleable, and the mold-board of cast iron, or sometimes of steel; while the coulter is frequently welded with steel on the right-hand side, the better to resist attrition. In most of the

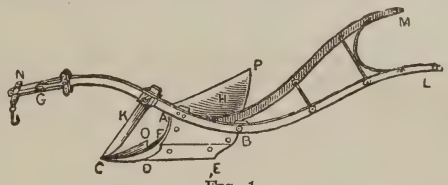


FIG. 1.

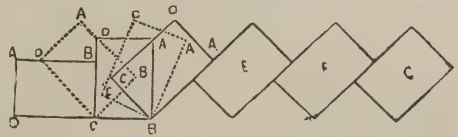


FIG. 2.

English (as distinguished from the Scotch) plows, wheels are attached at or near the front end of the beam, a contrivance which renders the implement more steady in its motion, more easily managed, and capable of doing better work in the hands of an inferior workman; but it is generally believed, in Scotland at least, that the plow without wheels, or *swing-plow*, as it is technically termed, is greatly more efficient in the hands of a thoroughly-skilled plowman. The usual dimensions of the furrow-slice in lea or hay-stubble are 8 or 9 in. in breadth by 6 in depth; and in land for green crop, 10 in. in breadth, and 7 or 8 in depth. Shallower plowing is not unfrequently adopted, especially on thin soils, and in various parts of England. Nor is it uncommon to plow stubble-land 10 in. or more in depth.

Other kinds of plows are used for special purposes, such as *trench-plows*, which are made on the same principle as the common plow, but larger and stronger, so as to bring up a portion of the subsoil to the surface; *subsoil plows* which have no mold-board, and merely stir and break up the subsoil, thus facilitating drainage; *double mold-board plows*, which are merely common plows with a mold-board on each side, and are employed for drilling turnip or potato land, for water-furrowing, and for earthing up potatoes, etc. Of each of these plows there are many varieties, each maker having generally some peculiar views regarding the form and proportion of some parts of the instrument. For those who wish to study minutely the best form of plow, it will be necessary to consult works on agriculture and agricultural implements. There is, however, one very peculiar form of plow sometimes used in various parts of England, which deserves more particular notice; this is the *turn-wrest plow*. Its chief peculiarity is, that instead of one, it has two mold-boards, one on each side, and these are alternately brought into operation, so that the furrow is always turned over in the same direction. The mold-boards are firmly fastened together in front, and kept at a constant distance from each other behind by means of struts, while the handles are movable with reference to them; the mold-board which is intended to be used being pushed away from, and the other (which for the time does the same work as the vertical surface ADEB in Fig. 1) brought nearer to the line of the beam; of course, when the next furrow is plowed, the mold-boards exchange adjustments. This form of plow is useful in plowing along a hillside, as by it all the furrows can be turned over towards the hill, thus preventing the natural tendency of the soil to work itself downwards, leaving the upper portions bare. Some years ago the *double-furrow* plow was introduced. It consists of an iron frame, similar in some respects to that of a grubber or cultivator, with two breast-plates, mold-boards, and shares; the one set a little back from the other, and so far distant as it is desired should be the width of the furrow. Two or three wheels bear the implements—one in front running in the bed of the last excavated furrow, and the other one or two behind. There is a directing-rod, but no stilts. The double-furrow plow was at first singularly popular, and after a few years was found on almost every farm. It was, however, soon found that, generally speaking, the weight was too much for the draught of a pair of horses, and that, even on light land, three horses were required. In fact, the depth of tillage is in practice gradually increasing; so that, unless for a grain crop after either turnips or potatoes, these plows have been nearly laid aside.

The operation of plowing can only be briefly referred to. Wherever the soil has been efficiently drained, the ridges can be made wider and plowed on the flat, high ridges being no longer necessary for carrying off the water. There are advantages in plowing the land in uniform ridges of 18 ft. wide, or with an open furrow not more than 72 ft. apart, made as flat as possible. But the effects of cultivation by steam show that the fewer the open furrows the better, particularly when the land is intended for a grain crop which is to be sown by drill or broadcast with machinery, and when the crop is to be cut with a reaping-machine, as is now almost universally the case. It is curious to notice how one improvement in farm practice leads on to another. The most common mode of plowing with horses is now simply by casting the soil two ridges in and the next two out, beginning always with the two ridges where last time was left the open furrow.

The term *feering* is applied to the commencement of a wide ridge. The process of feering differs according to the state of the land to be turned over. If there exists an old furrow or hollow, as is generally the case in lea, two shallow furrows are turned, the one against the other, and so on; along each side of this commencement the plow moves, adding furrow after furrow, and increasing in depth until the third or fourth round is reached. This constitutes what is technically called the gathering system. In newly cleaned land, or where a hollow does not appear to turn the first furrows into, two furrows are thrown out and then turned lightly in. The most common system, however, is what is known as *casting* or *cleaving*. That is, after one feering is accomplished, another is made at the other side of the ridge, and furrow after furrow is turned towards the inside of each of these feerings until the whole ridge is plowed, and then in the center is formed the *finish* or *mids*—a furrow or trench into which the feering is turned the next time the land is plowed.

The plow is one of the most ancient of implements, and is mentioned in the Old Testament at a very early period, iron shares being also incidentally noticed more than seven centuries B.C. The ancient Egyptian plow was wholly of wood, and in some

instances consisted of little more than a pointed stick, which was forced into the ground as it was drawn forward. In fact, the earliest plows were neither more nor less than varieties of the *hoe* (q.v.), worked by pressing the point into the ground instead of by percussion. The earliest form of the Greek plow, the *autoguon*, is an example of this; it was merely the trunk of a small tree, which had two branches opposite to each other, one branch forming the share and the other the handle, while the trunk formed the pole or beam. The more improved form, the *pekton*, in use among the Greeks, was not substantially different from the modern form in use in Mysia. The ancient Egyptian plow in one of its early stages, like the two forms above described, is devoid of all apparatus enabling the laborer to guide it, all that he can do being to press (by his weight applied to the handle) the share into the earth. The Egyptians, however, gradually improved the form, till it assumed the appearance of a hollow wedge formed by the two handles joined at the bottom, and with the beam fastened between the handles a little above their point of junction. The Romans, an essentially practical nation, largely improved on the plow, adding to it the coulter and mold-board, and occasionally attaching wheels to the beam to prevent the share from going too deep into the earth. The plow was almost unknown among the American aborigines, though Prescott describes a mode of plowing practiced among the Peruvians, which consisted in the dragging forward of a sharp-pointed stake by six or eight men, its sharp point, which was in front, being kept down in the ground by the pressure of the foot of another man who directed it. Britain and America, and their colonies are the only countries in which the plow has been brought to a state worthy of being considered effective, and even in Britain the most important amendments on it are not two centuries old. England took the lead in improvement by rendering the form more neat and effective, and by attaching wheels to aid in keeping the plow in a proper upright position. In Scotland, for some time after this, the plow was extremely rude and cumbrous, and usually drawn by 8 oxen, and some wooden plows are in use yet in the highlands of Scotland. In the middle of the 18th c., some Dutch plows were imported, and being found more effective, an impetus was thus given to attempts at improvement. James Small, who may justly be regarded as the real inventor of the Scotch or swing-plow, made great and important changes in the form and efficiency of the coulter, share, and mold-board, producing an implement at once lighter and vastly more efficient. All the swing-plows of successive makers are founded upon the basis of Small's plow. Wilkie of Uddingston (Lanarkshire) formed it wholly of iron, and his modification has been universally adopted in the modern plows. Among the various improvers of this form of cultivator may be mentioned, besides Wilkie of Uddingston, Gray of the same place, Clarke of Stirling, Cunningham, Barrowman, Ponton, Sellars, Huntly (who have sent many of the swing-plows, for which their firm has long been famous, to Australia). In England, the improvers have chiefly been Ransomes of Ipswich (the patentee in 1785 of the cast-iron share), Howard of Bedford, Hornsby of Grantham (Lincolnshire), and Busby of Bedale, the last of whom gained a medal for his mold-boards at the great exhibition of 1851. For further information concerning the plow and the mode of using it, see Morton's *Cyclopædia of Agriculture* (1856), Stephens's *Book of the Farm*, *Book of Farm Implements*, by Henry Stephens and R. Scott Burn, and other works.

Steam-plowing.—Although it is not yet a quarter of a century since cultivation of the land by steam came into successful operation, it is about two centuries and a half ago since it was foreseen to be possible. So long ago as 1618 David Ramsey and Thomas Wildgosse took out letters-patent for engines and machinery to plow the ground without the aid of oxen or horses; and nine years afterwards, other ingenious men obtained letters-patent for machines to effect a similar purpose. It is the opinion of Mr. Woodcroft of the patent office, who compiled the *Abridgments of the Specifications Relating to Steam-culture*, that steam was the motive power intended to be employed; but, as the first patent was taken out nearly 40 years before the Marquis of Worcester described the steam-engine in his *Century of Inventions*, the grounds for such an opinion do not seem quite satisfactory. In 1769, however, after the steam-engine had been applied to other purposes, there was lodged in the patent office a specification for a new machine or engine, to plow, harrow, and do every other branch of husbandry, without the aid of horses. The patentee was Francis Moore; and so confident was he of the merits of his plan, that he sold all his own horses, and persuaded his friends to do the same; "because the price of that noble and useful animal will be so affected by the new invention, that its value will not be one-fourth of what it is at present." Moore, however, was much too sanguine; his method of cultivating the land without the aid of animal power failed, as those of others before him had done.

The next invention necessary to mention was one by Maj. Pratt, patented in 1810. His plan was to have two engines, one on each headland, drawing, by means of an endless rope, an implement between them. In order to save the labor and loss of time in turning the plow at the ends, he attached two plows, back to back, making them work upon a fulcrum in the center of a frame, so that one could be raised out of the ground when the other was working. This was the first adoption of the balance-principle, now employed in most implements used in steam-cultivation. Maj. Pratt's apparatus, like those of his predecessors, never came into practical operation.

In the interval between 1810 and 1832, when Mr. Heathcoat, M.P., a Tiverton lace-

merchant, patented the first steam-plowing machinery that ever wrought successfully in the field, there were many inventions, but these being of little utility, need not be particularized. Mr. Heathcoat's machinery was principally intended for drainage and breaking up of soft or swampy land. It consisted of a locomotive steam-engine, with a broad, endless, flexible floor or railway attached to the wheels, so as to prevent them from sinking in the boggy soil. Opposite to this engine an auxiliary carriage was placed, and between the two the plow was drawn backward and forward by an endless chain or band—engine and carriage moving along as the work proceeded. In 1836 this plow worked with tolerable success in red moss in Lancashire, and in 1837 it was tried near Dumfries, under the auspices of the highland and agricultural society of Scotland; but here its performance, though in some degree satisfactory, was not sufficiently so to warrant the judges in awarding to it the prize of £500, which had been offered for the first successful application of steam-power to the cultivation of the soil by the society. The apparatus was very cumbersome and expensive to work, the engine being 25 horse-power, and the number of men and boys employed in the operation no less than ten. The amount of work done was at the rate of 8¼ acres per day. Mr. Heathcoat abandoned the machine after having spent about £12,000 on it.

After Mr. Heathcoat, the inventors specially worthy of mention are Alexander M'Rae, who, arranging his motive-power in the same manner as maj. Pratt, made the important addition of a barrel to the plow-frame upon which the slack-rope was to be wound up; Mr. Hannam of Burcote, who, in 1849, designed an apparatus to be driven by an ordinary portable engine, to be stationed at the corner of the field, which was surrounded with wire-ropes in the same way as will be afterwards described in Howard's method; and Mr. Tulloh Osborn, who, in 1846, patented a plan for two engines running opposite each other on the headlands, having two drums fixed to them, one for the winding of the tight, and the other for letting out the slack, gear. This apparatus was tried by the marquis of Tweeddale for some time at Yester; but it was found, in consequence of the great power required, and other defects in detail, to be very expensive, and was ultimately given up. To the marquis of Tweeddale, therefore, belongs the honor of being the pioneer of steam-cultivation in Scotland.

In 1855, the Messrs. Fisken of Stamfordham, Newcastle-upon-Tyne, took out a patent for a much more perfect apparatus for cultivating the land by steam than any that had previously appeared. The power was transmitted by a stationary engine to a hempen rope (the Messrs. Fisken being anxious to dispense with wire-ropes), which was worked at a high velocity, and, passing round pulleys on two self-moving anchors, turned a drum upon the plow, whose revolution imparted motion to the implement upon which it was fixed. The important features in this system were the self-propelling anchors, the arrangement of the plows on the balance-principle, and the mode of steerage. This plow was exhibited at the annual show of the royal agricultural society of England in the year the patent was taken out, and excited great interest, but failed to obtain any award. Three years before this, the highland and agricultural society of Scotland had thought so hopefully of the idea, that a grant was voted out of its funds to assist the author in maturing his project.

In 1854 Mr. Fowler exhibited his patent steam-draining apparatus at the Lincoln meeting of the royal agricultural society of England; and from this time may be dated the practical history of cultivation of the land by steam; for the idea that such an apparatus could be wrought advantageously in other field-operations entered the mind of a practical farmer, Mr. Smith of Woolston, near Bletchley; and, under the direction of Mr. Fowler, he got constructed an apparatus, which, with modifications, he worked successfully.

The inventions since that time need not be enumerated. It may be stated generally that they have included plans for engines traveling over the surface of the ground, drawing plows or other cultivating implements along with them; engines working on tramways, and drawing implements after them; engines moving along opposite headlands, and working implements between them by means of wire-ropes, and stationary engines driving implements also by means of wire-ropes. The first two principles have been mostly abandoned—the one on account of the great consumption of fuel, and the large amount of wear and tear occasioned to move the engine over uneven and soft ground; and the other, on account of the expense necessary to lay down rails over a farm. The only two systems in practical operation are what are called the direct and round-about—the former where the pull of the implement is directly to and from the engine; and the latter where the implement is drawn at right angles.

The best known of these methods are Fowler's and Howard's, though, perhaps, Smith should be credited with the round-about system, but Howard's name is now much more generally given to it.

In Fowler's system the principal elements are an engine an anchor, a wire-rope, and a balance-plow. In commencing operations, the engine is placed at the end of one of the headlands of the field, and directly opposite it on the other headland is placed the anchor. Beneath the engine there is a large sheave or drum, 5 ft. in diameter, the groove of which drum is composed of a series of small leaf-like pieces of chilled cast-iron, each moving independently upon its own axis. The object of these is to prevent the rope from slipping (which it is apt to do in a plain groove under great strain), and

this they do in a very ingenious manner, by closing on the rope as soon as it takes the bend—that is, as soon as the rope presses upon them—and they in the same manner open and release it immediately on the pressure being removed, or, in other words, as soon as the rope resumes the straight on the other side of the sheave. The anchor is a massive square framework of wood, mounted on six sharp disk wheels, each about 2 ft. in diameter, which cut deep into the ground, and on the lightest land they take such hold as effectually to resist the pull of the rope which is passed round the sheave beneath. The anchor has a self-acting motion—the power being communicated from the engine through the medium of the plowing-rope—which enables it to move along the headland, and keep opposite to the engine. The plow is a framework of iron, balanced upon two large wheels. To each side of this framework there are attached four plow-bodies and coulters, so that four furrows are cut at one "bout," and the headland on which the anchor is stationed being reached, the end of the beam that was out of the ground is depressed (the other, of course, being raised), and the four plow-bodies that were out of the ground, and which point in the opposite direction, are inserted in the soil, and turn up the furrows on the way back to the engine. By altering the position of the plow-bodies along the frame-work, a broad or a narrow furrow can be cut at pleasure. In ordinary working, an acre an hour is accomplished. The wire-rope, by which the plow is dragged through the land, passes round the sheaves on the anchor and the engine, the ends are attached to two drums upon the plow; and, by a nice mechanical arrangement, the plowman who rides upon the implement is enabled to wind up, or let out slack if necessary, without loss of time. The wire-rope is made in lengths, which are easily disjoined, in order that it may be adjusted to irregularly shaped fields, or rather to fields that are not exact squares or parallelograms; for Fowler's method is not well adapted to such irregularities as prevent the engine and anchor being opposite each other. The rope is borne off the ground—a very necessary precaution, without which the wear and tear would be alike annoying and expensive—by a number of pulleys, or "rope-porters," as they are called, mounted on frames. The outside ones, that is, those furthest from the work, are moved along by the action of the rope; those in front of the plow are removed by boys, and placed behind the implement as it proceeds. The *modus operandi* will be patent at a glance, from the annexed plan of working (fig. 3). To man-

FIG. 3.—Fowler's Anchor, Engine, and Plow at work.

age this apparatus three men and two boys are required—namely, a man at the engine, another on the plow, a third at the anchor, and the lads to look after the rope-porters. The water and coals needed for the engine must be brought by other men.

The plow-bodies can be removed from the frame, and in their place "digging-breasts" be attached, by means of which the land is thrown up in a somewhat similar manner to that in which it is turned over by the spade. The price of the plowing and cultivating apparatus is about £900. See illus., AGRICULTURE, vol. 1.

At the Newcastle show of the royal agricultural society, in July, 1864, Mr. Fowler introduced two engines of 7-horse power, working simultaneously on opposing headlands. The expedition with which these engines were set down to and completed their work was a matter of admiration to all present, and the subject of special remark by the judges. These gentlemen say: "The engines worked smoothly; and so far as we could ascertain, appeared to bear an equal share of work in either direction." They got up steam in nearly half an hour less time than the 14-horse engine, and working with them, much less time was required to arrange the tackle. "The engines were masters of their work; and acting in combination, appeared to possess more power than the large engine and anchor. . . . . The advantages of this system appear to be, that horses are not required to move tackle; that there is a saving of time in setting down, taking up, and removing from field to field [no unimportant consideration]; and that the two small engines are both available for ordinary farm-work, such as thrashing, driving, barn-work, etc." The cost of the two engines, with the whole apparatus, ranges from £1200 to about £1500, according to the power of the engines, etc. The number of hands employed is the same as at the large anchor and engine; but as a skilled laborer is necessary, where only an unskilled laborer is needed in the latter case, the cost per day is 2s. more. Fowler has been very successful in gaining prizes for steam-plows, having won several thousand pounds in this way since 1856.

Howard's earliest system consists in a stationary engine driving a windlass, having two winding drums, with direct and reverse action, placed in front of it, round which is coiled about 1600 yards of wire-rope. By a simple lever movement, the man can drop the winding drums out of gear in an instant, a contrivance which enables him to

attend to the proper coiling of the rope, and also to arrest, in case of accident, the plow in a moment, without stopping the engine. The engine is usually placed at the corner of the plot to be plowed, the rope is carried round the field on rope-porters, and fixed at the corners by light anchors. A snatch-block placed in front of the windlass prevents the slack-rope running out too fast, and trailing on the ground. The plow is composed of two strong iron frames balanced upon four wheels, and crossing each other at their inner ends, thereby decreasing the length of the plow, and, as a matter of course, the breadth of the headland. The frames are raised and lowered in such a manner that the set of plows out of work is independent of, and has no tendency to weigh or raise out of the ground the set in work. The frames are made for two, three, or four furrows, and "diggers" or scarifiers can be attached as in the case of Fowler's. The latest improvements of a material character on the Bedford firm's steam-plowing tackle consist of a patent self-coiling windlass and universal joint, 1600 yards of steel rope, patent 5-tined self-lifting cultivator, 2 self-moving anchors, etc. Two men and two boys are sufficient to work the set with a 12-horse-power patent plowing and traction engine; the cost of the set is £1000. This recently introduced apparatus is very popular, and promises to be extensively employed.

Howard's double-engine system is specially adapted for letting out on hire, for large farms, and for use on the great foreign plains. The engines are placed on opposite headlands, and work a plow, grubber, or cultivator between them, similar to the principle on which Fowler's double-engine system operates. Three men and two boys are required to the working of this set. The price of a pair of 12-horse patent plowing and traction engines, each with winding drum, together with 800 yards of steel wire rope, and 6 rope-porters, is £1350.

In the course of the last few years, the Messrs. Howard have issued several hundred sets of steam-cultivating tackle. The Messrs. Howard's cultivator was more generally used for some time than the plow, but the mere digging of much of the land for corn, as a substitute for plowing, was attended with disappointment; so the plow has been all but universally adopted for soil intended for grain crops.

The Fisken tackle is used to a considerable extent in various parts of the country, generally with the plow emanating under that name, and sometimes attached to three-furrow plows made by local manufacturers. Several of the other famed firms dispose of parts of the complete set separately. In other words, those who buy the engines and gearing do not in every case purchase the plow from the same company.

In Coleman's system, the drums upon which the rope is wound are attached to the sides of the engine, and give out and take on rope alternately. The engine moves along the headland; and the anchor, upon which there is very little strain, and which is, therefore, a very light, portable article, is shifted opposite to it by a man as the work is performed; direct action being obtained here, as in the case of Fowler's. The peculiarity of the plan consists in having two implements instead of one at work, the implements being grubbers, which smash up the ground—a practice adopted by some farmers in England, in preference to turning the sod over with the plow. On commencing operations on this plan, the field is divided into two equal parts. The cultivators or grubbers work only one way—*toward* the engine. They are attached by the front to each end of a strong wire-rope, while a smaller wire-rope is fastened to their rear. The one cultivator is placed at the far side of the field, where its teeth or "tines" are inserted in the ground; and it is pulled toward the center of the field, tearing up the soil as it comes, the other meanwhile going out empty to meet it. When the latter reaches the middle of the field, the action of the engine is reversed, and it is dragged back to the engine, cultivating the land as it travels, while the other goes back to the headland empty. The pull out empty and working in is, of course, continued until the whole land has been tilled.

There are some other systems of steam cultivation before the public, but in various respects they resemble those already enumerated. With Coleman's method there may be a slight saving of time at the ends, but there is, on the other hand, a trifling loss of power. In every sense of the term, the systems of the Messrs. Howard, and Fowler and Co., are the most popular. Each of these leading systems has its advocates and its advantages. It is certainly a much more expensive plan to have two engines, but yet for letting for hire it may be the best and cheapest, as they take the apparatus from one place to another, and set to work again more rapidly. It is, however, easy enough to keep one steam-engine always running at full speed, and there seems little reason to keep one engine simply to look at the other, seeing the expense is the drawback which prevents their universal adoption. Besides, the single engine on the round-about system is decidedly best for the working up of corners of fields, and as it does not move along headlands, it does not destroy them; but can continue working while the locomotive remains idle. On soil where there are many stones, it is better first to grub the land thoroughly, and remove the stones, before using the plow.

Where the fields are pretty large, stones not abundant, and the soil heavy, the odds are all in favor of steam cultivation. Not only is the tillage more thorough than could be otherwise accomplished, but there is a greater chance of getting the land worked in better condition. That is to say, the great speed by which the soil can be turned—on an average, about three-fourths of an acre per hour—enables the advantages of weather and

seasonable soil to be more extensively embraced. Then every farmer knows, or should know, the benefits of deep cultivation, where the soil admits; and by steam-power, more than in any other way, this great desideratum is likely to be obtained. There is a danger, however, arising from deep plowing, provided the increased depth is not gradually affected. For instance, if three or four inches of fresh soil is suddenly brought to the surface, and the manuring applied in the usual way, the succeeding crop, if not even crops, is often disappointing. The fresh excavation, in short, has not been fertilized unless very special treatment is bestowed. The best time to introduce the deep furrow is preparatory to the green crop, as with the bulk of the ordinary farming (Scotch especially) that is the rotation which is accompanied by the heaviest manuring of the course. Stunted crops do not now follow the introduction of steam-power, or rather deepened cultivation, to any material extent, but when the causes and cures were not so well known in the earlier days of steam-plowing history, failures for a year or two were more notable. The high price of horses, lately developed into extravagance, together with the growing and already high rate of farm-servants' wages, have stimulated considerably the application of steam-power to the tillage of the soil of Britain. The two principal firms at Leeds and Bedford, already referred to, have an enormous demand just now from all quarters for steam-cultivating apparatus. In Britain, it is computed there are considerably over 1000 steam-tackles at work, and the exports to the continent, to some parts of America, to the East and West Indies, and to Egypt, is considerable and growing. Before the American revolution there were but few plows in the colonies, and these mostly of the rough wooden sort. After the war great attention was given to improving agricultural implements. Thomas Jefferson experimented on the clumsy English bull-plow, 1788–93, and his son-in-law, Col. Randolph, invented the hill-side plow. In 1816 Jethro Wood of New York invented a cast-iron plow, much lighter and more easily managed than any previous implement of the kind. The shape of his mold-board has been but little improved, though subsequently it was made of steel, which greatly lessened the adhesion of the soil to its surface; and more recently the chilling process has been applied to it, increasing its durability. Great improvements have been made in lightening the weight and lessening the draft. The sulky plow has come much into use, with considerable advantages in lessening friction, and the labor of the plowman. Many varieties, adapted to various kinds of work, are in use, among them a light and serviceable modification of the double-furrow plow, described in the main article; a number of different forms of reversible hill-side plow, combination plow, and pulverizers; gang plows, which consist of two or more small plows, running side by side between wheels; and many others. But though American invention has done so much, this country is strangely behind in the use of the steam-plow, which has revolutionized plowing upon the large farms of England and Scotland, where there are now over 3,000 in use. They have been largely introduced also on the European continent, and in some countries of Asia, Africa, and South America. Some early attempts at steam-plowing were made in this country, which were failures, as were the early attempts in England. So much money was sunk in these abortive efforts that the idea of making steam-plowing practicable was abandoned. But as it has been practically demonstrated that with the later inventions of steam-plow, as already described above, not only can cheaper work be done upon large farms, but a deeper and more efficient cultivation be obtained, besides the saving of time and labor, it cannot be long before steam-plowing will come into general use in this country, especially upon the extensive western farms.

PLOWDEN, Edmund, 1519–84; b. England; at first studied medicine and surgery at Cambridge and Oxford, and according to Anthony-à-Wood did not take up the study of the common law till his 36th year. Plowden himself, however, says, in the preface to his *Commentaries*, that he began to study law in his 20th year, and the 30th of the reign of Henry VIII. He was twice a reader of the middle temple, and near the close of Mary's reign was made sergeant-at-law. He wrote *Commentaries, or Reports of Divers Cases in the Reigns of Edward VI.*, etc., in Norman-French; and *Queries, or a Moot-Book of Cases.*

PLUM, *Prunus*, a genus of trees and shrubs of the natural order *rosaceæ*, suborder *amygdaleæ* (q.v.) or *drupaceæ;* the species of which have the stone of the fruit sharp-pointed at each end, with a longitudinal furrow passing all round, and a smooth surface; the fruit covered with a fine bloom, and the young leaves rolled up. The common plum, the bullace, and the sloe, are generally reckoned by botanists as distinct species, but with much doubt if they are really distinct, as the plum passes into the bullace, and the bullace into the sloe by insensible gradations; although there is so wide a difference in general appearance, size of leaves, and size as well as quality of fruit, between the best cultivated plums and the sloe, that it is not without an effort we can imagine them to have sprung from a common stock. The Common Plum (*P. domestica*) appears in a wild state in woods and hedges in many parts of England and on the continent of Europe; probably, however, often derived from the seeds of cultivated trees. It is commonly described as destitute of spines, and as further differing from the bullace in having the under-side of the leaves smooth except when they are very young; but if these characters are adopted, many of the cultivated plums must be referred to the bullace (*P. insititia*) as their original; nor does the ovate fruit afford a more certain character, some of the finest garden plums being globose or nearly so, like the bullace. The varie-

ties called damson (q.v.) are particularly like the bullace, except in the form of the fruit. Cultivated plums vary greatly in the size, form, color, and flavor of the fruit. The fruit of some varieties, as the *white magnumbonum*, is 2 in. long; while damsons of the same shape are not quite 1 in., and a single fruit of the one is equal to at least 8 or 10 of the other. The best varieties of plum are among the most delicious dessert fruits; among these, the *green gage* (*reine claude* of the French) is one of the most esteemed both in Britain and on the continent of Europe, and is unsurpassed both in sweetness and flavor. The inferior varieties are used in pies, conserves, and sweetmeats. Some of them are very austere. In moderate quantity plums are wholesome enough; but excess in the use of them is very apt to produce colic, diarrhea, and cholera. The danger is greater if they are eaten before being perfectly ripe. A very pleasant wine is made from plums; and in some parts of Europe a strong spirit is distilled from them after fermentation; but for this purpose they are mixed in the s. of France with honey and flour, and in Hungary with apples.—The dried fruit, variously known as *dried plums*, or *French plums*, and *prunes* (q.v.), is much used for the dessert; and the somewhat austere fruit of the *St. Julien plum*, cultivated in the s. of France, becomes, when dried, the medicinal prune, used as a mild laxative. The drying of plums is effected very slowly in ovens, by a heat which is gradually increased. The process requires great care. The prunes called *brignoles* are the produce of a variety grown principally near the little town of Brignole in Provence. The plum has been in cultivation from ancient times, and the first fine varieties were probably introduced into Europe from the east The finer varieties are propagated chiefly by budding on stocks of the coarser kinds, which are procured either from seed or as suckers from the roots of plum-trees. The coarser varieties are propagated by suckers, without budding. A free loamy soil is best for plums. They are grown as standard, espalier, or wall trees. As standards, some of the varieties attain a height of more than 20 ft., with a moderately spreading head. The fruit is mostly produced on spurs, but some of the finest fruit on the shoots of the former year. Among the varieties of plum are some which ripen their fruit early, and others which ripen late in the season. The blossom of some of the finer kinds is often protected by gardeners, like that of peaches and apricots.—The wood of the plum-tree is hard and fine-grained, and is used in cabinet-work, in turnery, and for making musical instruments.—The Cashmere Plum (*P. Bokharensis*), cultivated in Cashmere and Bokhara, is regarded as a distinct species.—The Cherry Plum, or Myrobalan Plum (*P. cerasifera* or *myrobalanus*), is a bush very similar to the sloe, with pendulous globular red fruit. It is a native of North America, but is often cultivated for its fruit on the continent of Europe. In Britain it seldom produces fruit.—*P. maritima* is a shrub, indigenous to sandy soils on the sea-coast of North America from New Jersey to Carolina. It has a dark purple agreeable fruit, about the size of a pigeon's egg.

The Cocoa Plum or Icaco of the West Indies is the fruit of *chrysobalanus icaco*, a tree of the natural order *rosaceæ*, suborder *chrysobalaneæ*. The fruit resembles a plum, has a sweet although slightly austere taste, and is eaten both raw and preserved.—The fruit of *parinarium excelsum*, another of the *chrysobalaneæ*, is called gray plum at Sierra Leone.

PLUM, Date. See Date Plum.

PLUMAGE OF BIRDS. See Birds and Feathers.

PLUMAS, a co. in n.e. California, watered by the Middle and North forks of Feather river, about 2720 sq.m.; pop. '90, 4923, chiefly of American birth. The surface consists of fertile valleys, great forests, and lofty cañons. The Sierra Nevada crosses it. The valleys are adapted to grazing. Slate and marble are found. Much gold is mined. Co. seat, Quincy.

PLUMB, Preston B. : b. Delaware co. O., 1837. He learned the printing art, and removed to Kansas, 1856 ; was a member of the Leavenworth constitutional convention, 1859 ; was admitted to the bar, 1861 ; was in the state legislature, 1862. He entered the union army as second lieut. of the 11th Kansas infantry, and was promoted to lieut.-col. of that regiment. He was speaker of the Kansas house of representatives, 1867, and a member, 1868. He was sent as a repub. to the U. S. senate, 1877 ; and was re-elected 1883, and again in 1889. He died Dec. 20, 1891.

PLUMBAGINEÆ, or Plumbaginaceæ, a natural order of exogenous plants, herbaceous or half-shrubby; with leaves somewhat sheathing at the base, and often clustered; flowers in panicles or in heads; calyx tubular, persistent, plaited; corolla very thin, of one or five petals; stamens five; ovary superior, one-celled, with a solitary ovule; styles generally five; fruit a utricle (q.v.). There are about 160 known species, chiefly found on the sea-shores and in the salt marshes of temperate regions. Some are found also in elevated regions, in all zones. Many have flowers of great beauty, and are therefore favorites in gardens. Some are occasionally used in medicine as tonics and astringents; others, being exceedingly acrid, as vesicants, particularly species of *plumbago*.

PLUMBAGO. See Black Lead.

PLUMBING. See Sanitary Science.

PLUMED MOTH, the popular name of a group of "*nocturnal lepidoptera*," known to entomologists as *fissipennæ* and *pterophorites*; remarkable for having at least a pair of

the wings, and often all the wings, longitudinally cleft into two or more—sometimes six—divisions, which are beautifully fringed at the edges. The wings are similar to those of other moths in their nervures, but the membrane which usually connects the nervures is interrupted. The plumed moths are extremely beautiful.

PLUMER, William, was born at Newbury, Mass., in 1759. He studied law and was admitted to the bar. He was eight times elected to the New Hampshire legislature; was United States senator from 1802 to 1809, and governor of New Hampshire in 1812, 1816, 1817, and 1818. He died in 1850. See the life by his son (1856).

PLUMER, William Swan, D.D., LL.D., 1802–80; b. Penn.; graduated at Washington college, Va., in 1825; studied theology at Princeton; was licensed to preach in 1827; organized a Presbyterian church in that year in Danville, Va.; subsequently organized another church at Warrenton, N. C., and preached at Raleigh, Washington, and New Berne in that state; became pastor of a church in Richmond, Va., in 1834, and editor of the *Watchman of the South* in 1837–45; removed to Baltimore in 1847, where a church was built for him. In 1854 he became prof. of theology at the Western seminary, Allegheny, Penn.; and in 1866 was called to the professorship of didactic and polemical theology in the Presbyterian theological seminary at Columbia, S. C. The circulation of his numerous volumes and tracts for the American tract society has been more than 5,000,000 copies. Some of the volumes have been printed in foreign languages. A still larger number of distinct works were published by other houses, and his contributions to the newspapers were numerous. He was the author of commentaries on the *Psalms*, *Romans*, and *Hebrews*.

PLUMIER, Charles, a French botanist of distinction, was born at Marseilles in 1646. He studied botany under the celebrated Joseph de Tournefort (q.v.), and in 1689 visited the West Indies. On his return he published his work entitled *A Description of the Plants of America*, with numerous plates (1693). At the king's request, he again twice visited North America in 1693 and 1695. In 1703 appeared his *Nova Plantarum Americanarum Genera*. When about to sail the fourth time for America, in order to investigate the subject of Peruvian Bark (cinchona), he died at Cadiz in 1704. A work that is still often consulted is his treatise on the ferns of America, which appeared in the year after his death. It contains 172 engraved plates. See Haller's *Bibliotheca Botanica*.

PLUMMER, Joseph B., general, was born at Barre, Massachusetts in 1820; graduated at West Point in 1841; was in the Florida and Mexican wars; rendered important service in several engagements in Missouri early in the civil war, for which he was made brigadier-general of volunteers in Oct., 1861; and was in the campaign in Tennessee and Mississippi, dying at Corinth, Aug. 9, 1862.

PLUMMET, a weight of lead hung on a string, and attached to a frame, for the purpose of showing the vertical line.

PLUMPTRE, Edward Hayes; b. Eng., 1821; educated at University college, Oxford; became fellow of Brasenose in 1844; was chaplain at King's college, London, in 1847; prof. of pastoral theology there in 1853; prebendary of St. Paul's in 1863; prof. of the Exegesis of the New Testament in 1864; assistant preacher at Lincoln's Inn, 1851–58; Boyle lecturer, 1866–67; rector of Pluckley, 1869, and vicar of Bickley, 1873, and dean of Wells, 1881. He became in 1875 one of the Old Testament company of revisers appointed by the convocation. He published *Sermons; Lazarus and other Poems; Master and Scholar*, etc. (poems); *Christ and Christendom; Boyle Lectures; Translations of Sophocles and Æschylus; Biblical Studies;* notes on the Book of Proverbs in the *Speaker's Commentary;* papers in the *Biblical Educator;* of which he was editor; and notes on the first three Gospels in Ellicott's *New Testament for English Readers*. He likewise contributed articles to Dr. Smith's *Dictionary of the Bible*, the *Quarterly*, *Edinburgh*, and *Contemporary Reviews*, the *Expositor*, *Good Words*, and the *Sunday Magazine*. He died in 1891.

PLU'MULE. See Seed.

PLU'RALISM, in canon law, means the possession by the same person of two or more ecclesiastical offices, whether of dignity or of emolument. Pluralism has been held unlawful from the earliest times, and is forbidden by many ancient councils, as Chalcedon, c. x. (451 A.D.), 2d Nicæa, c. xv. (787 A.D.). This prohibition, however, was not regarded as absolute and admitting no possible exception; the natural ground of the prohibition being the impossibility, in ordinary cases, of the same individual adequately discharging the duties of more than one office. It has been held, therefore, that in cases in which this impossibility does not really exist, the union of two or more offices in the hands of one person might, speaking absolutely, be permitted without infringing the divine law. Canonists therefore distinguish "compatible" and "incompatible" beneficies or dignities. Two benefices may be incompatible in three ways—(1) if each requires residence (*ratione residentiæ*); (2) if the duties of both fall to be discharged at one and the same time (*ratione servitii*); or (3), if the revenue of either fully suffices for the becoming maintenance of the incumbent (*ratione sustentationis*). In other cases benefices or dignities are considered compatible, and with the due dispensation may be held by the same person. The rule by which dispensations from the law of residence are to be regulated, as well as the penalties for its violation, whether on the part of the patron or on that of the recipient, have formed the subject of frequent legislation, as in the 3d and 4th councils of the Lateran, in the decretals of Innocent III. and many other popes, and especially in

those of the council of Trent. In general, it may be said that the canon law regards as incompatible (1) two benefices each having the cure of souls; (2) two "dignities;" (3) a "dignity" and a cure of souls; (4) a cure of souls and a simple benefice requiring residence. In other cases than these the pope is held to have the power of dispensing. There is no department of discipline, however, in which the tendency to relaxation has been greater or more persistent; and one of the gravest of the abuses of the church was the prevalence of pluralism of "incompatible" benefices, even of bishoprics; and although a constant effort was made to prevent this abuse, the evasions of the law were not only frequent, but even screened from punishment. In later times the evil has in great measure disappeared in the Roman Catholic church.

The English law, before the reformation, in the main coincided with the canon law; and the legislation of Henry VIII. preserved the same general spirit, only substituting the dispensing power of the crown for that of the pope.

By 13 and 14 Vict., c. 98, it is provided that no incumbent of a benefice shall take and hold together with it another benefice, unless the churches are within three miles of one another by the nearest road, and the annual value of one of them does not exceed £100. Nor can two benefices be held together if the population of one exceeds 3,000, and that of the other exceeds 500. The word benefice in this sense includes any perpetual curacy, endowed public chapel, parochial chapelry, or district chapelry. But a dispensation or license can be obtained from the archbishop, so as to allow two benefices to be held together; and if the archbishop refuse his license, the party may appeal to the privy council. A special provision is also contained whereby the head ruler of any college or hall in the universities of Oxford or Cambridge, or warden of Durham university, is prohibited from taking any cathedral preferment or any other benefice. If any spiritual person holding a benefice shall accept another benefice contrary to the statute, the first benefice shall *ipso facto* become void. At the same time, provision is made by statutes for uniting benefices where the aggregate population does not exceed 1500, and the aggregate yearly value does not exceed £500.—In Ireland no faculty or dispensation could be granted to any spiritual person to hold two or more benefices.—In Scotland it is contrary to an old Scotch statute for a minister of the established church to hold two or more charges; but the question has arisen almost exclusively with reference to clergymen appointed professors before or after an appointment to a country charge, in which case a resignation is necessary of one of the offices within a certain time after the appointment; but this disqualification does not apply to city charges.

PLUSH (Fr. *peluche*), a variety of woven cloth, having a long shaggy pile on the upper surface. Although woven like velvet, it differs from it in the greater length of the pile, and in its not being clipped or shorn to a uniform length. Formerly it was made of a double warp, one thread being usually double worsted yarn, the other, intended to form the pile, of goat's hair, and the weft of worsted; occasionally only worsted was used. Now it is made very extensively of silk and cotton, the silk taking the place of the goat's hair to form the pile. This silk plush is the material now almost universally used for making gentlemen's hats, instead of beaver-hair, as formerly. It is also worked in colored silks, for many articles of ladies' attire. See WEAVING.

PLU'TARCH (*Ploutarchos*), the biographer and moralist, was b. at Chæroneia in Bœotia. We can only approximate to the year of his birth. He tells us himself that he was a student of philosophy at Delphi, under Ammonius, when Nero was making his progress through Greece in 66 A.D.; and we may safely infer, therefore, that in that year he was beyond the age of puberty. He lived for some years in Rome, and in other towns of Italy, where he seems to have been much occupied with public business, and with giving lessons in philosophy—a circumstance to which he attributes his having failed to learn the Latin language in Italy, and his having to postpone his studies in Roman literature till late in life. During the reign of Domitian he was delivering lectures on philosophy at Rome; but we have not sufficient evidence for the statement that he was preceptor to Trajan, or that that emperor raised him to consular rank. The later years of his life he spent at Chæroneia, where he discharged the duties of archon and priest of Apollo. He lived down to 106, the eighth year of the reign of Trajan; but how much longer is not known. He was married to an amiable wife of the name of Timoxena, by whom he had several sons, who reached manhood, and left descendants.

The work by which Plutarch is best known is his *Parallel Lives* of 46 Greeks and Romans. These are arranged in pairs, each pair forming one book (*biblion*), consisting of the life of a Greek and a Roman, and followed by a comparison between the two men. In a few cases, the comparison is omitted or lost. The heroes of these biographies are the following: 1. Theseus and Romulus; 2. Lycurgus and Numa; 3. Solon and Valerius Publicola; 4. Themistocles and Camillus; 5. Pericles and Q. Fabius Maximus; 6. Alcibiades and Coriolanus; 7. Timoleon and Æmilius Paulus; 8. Pelopidas and Marcellus; 9. Aristides and Cato the elder; 10. Philopœmen and Flamininus; 11. Pyrrhus and Marius; 12. Lysander and Sulla; 13. Cimon and Lucullus; 14. Nicias and Crassus; 15. Eumenes and Sertorius; 16. Agesilaus and Pompeius; 17. Alexander and Cæsar; 18. Phocion and Cato the younger; 19. Agis and Cleomenes, and Tiberius and Caius Gracchus; 20. Demosthenes and Cicero; 21. Demetrius Poliorcetes and M. Antonius; 22.

Dion and M. Junius Brutus. In addition to these are placed in the editions after the 46th *Parallel Lives*, the biographies of Artaxerxes Mnemon, Aratus, Galba, and Otho. Plutarch has no equal in ancient, and few in modern times, as a writer of "lives." His power lies in his felicitous grasp of the character as a whole, and his skill in keeping minor details in subordination. It is not till the reader has seen the portrait in its completeness that his attention is attracted to accessory points. "There are biographers (says an admirable writer in the *Quarterly Review*) who deal with the hero, and biographers who deal with the man. But Plutarch is the representative of ideal biography, for he delineates both in one." Yet with all their artistic harmony, his lives abound with anecdotes and *bon-mots* in such profusion that they form one of our chief authorities for the table-talk of the Greeks and Romans. Their popularity in ancient, mediæval, and modern times, with readers of every rank and age, is something extraordinary, and they have in consequence exerted a very powerful and a very salutary influence on the art of biography, as subsequently practiced. The other writings of Plutarch, more than 60 in number, are included under the general title of *Moralia*, or ethical works. Several of these are not purely ethical in their tenor; while many of them are probably not by him, or if they are, do him small credit. Even in the best of the *Moralia*, there is no philosophical system to be found; their merits are not speculative, but practical; and their value consists mainly in their good sense, in the justness of their views on the ordinary affairs of human life; and in the benevolence of tone diffused throughout them. The best text of the lives is that of Immanuel Bekker; the best translation in English is that of Dryden and others, as re-edited by Clough. The best edition of the *Moralia* is by Emerson (Boston, 1880); and of the entire works, the editions of Reiske (Leip., 1774–82) and Hutten (Tübingen, 1791–1805). Some of the lives have been edited by Holden.

PLU'TEUS, in classical architecture, a wall filling up the space between two columns. Also the space between two, orders, placed over one another, as in the amphitheater, etc.

PLU'TO (Gr. *Ploutōn*, from *plouteo*, to be rich), originally only a surname of HADES, as the giver or possessor of riches, is, in the mythology of Greece, the third son of Kronos and Rhea, and the brother of Zeus and Poseidon. On the tripartite division of the universe, he obtained the sovereignty of the under-world—the realm of darkness and ghostly shades, where he sits enthroned as a "subterranean Zeus"—to use the expression of Homer, and rules the spirits of the dead. His dwelling-place, however, is not far from the surface of the earth. Pluto is inexorable in disposition, not to be moved either by prayers or flatteries. He is borne on a car, drawn by four black steeds, whom he guides with golden reins. His helmet makes him invisible, whence, according to some scholars, his name of *Hades* (from *a*, priv., and *idein*, to see); although others, with at least equal probability, derive Hades from *hado* or *chado*, to receive or embrace, and translate the word the "all-receiver." In Homer, Hades never means a place, but always a person. Moreover, it is to be noticed that the poet does not divide the realm of the shades into two separate regions. All the souls of the dead—good and bad alike—mingle together. Subsequently, however, when the ethical conception of future retribution become more widely developed, the kingdom of the dead was divided into Elysium (q.v.), the abode of the good, and Tartarus (q.v.), the place of the wicked. This change also exercised an important influence on the conception of Pluto. The ruler of the under-world not only acquired additional power and majesty, but the very idea of his character was essentially modified. He was now regarded as a beneficent deity, who held the keys of the earth in his hand, and possessed its metallic treasures (whence his new name *Pluto* or *Plutus*), and who blessed the year with fruits, for out of the darkness underground come all the riches and swelling fullness of the soil. Hence, in later times, mortals prayed to him before proceeding to dig for the wealth hidden in the bowels of the earth.

Pluto married Persephone (Proserpina), the daughter of Demeter (Ceres), after carrying her off from the plains of Enna. He assisted his brothers—according to the mythological story—in their war against the Titans, and received from the Cyclops, as a reward for delivering them from Tartarus, the helmet that makes him invisible, which he lent to Hermes (Mercury) in the aforesaid war, to Perseus in his combat with the Gorgons, and which ultimately came to Meriones. The Erinnyes and Charon obey his behests. He sits in judgment on every open and secret act, and is assisted by three subordinate judges, Æacus, Minos, and Rhadamanthus. The worship of Pluto was widely spread both among the Greeks and Romans. Temples were erected to his honor at Athens, Elis, and Olympia. Among trees and flowers, the cypress, boxwood, narcissus, and maidenhair were sacred to him; bulls and goats were also sacrificed to him amid the shadows of night, and his priests had their brows garlanded with cypress wreaths. In works of art, he resembles his brothers Zeus and Poseidon; only his hair hangs down somewhat wildly and fiercely over his brow, and his appearance, though majestic, as becomes so mighty a god, has something gloomy and terrible about it. There can be little doubt that he, as well as Pan (q.v.), helped to trick out the conception of the devil prevalent during the middle ages, and not yet extinct. If it was from Pan that the devil derived those physical characteristics alluded to in the famous *Address to the Deil* by the poet Burns:

> O thou, whatever title suit thee,
> Auld *Hornie*, Satan, Nick, or *Clootie*.

it is no less certain than it is to Pluto he owes his position as "king of hell," "his blackness," and many of his insignia. See illus., MYTHOLOGY, vol. X.

PLUTON'IC ROCKS, the name given by Lyell to the granitic rocks, from the supposition that they were formed at considerable depth in the earth, and were cooled and crystallized slowly under great pressure. They were so designated in contradistinction to the volcanic rocks, which, though they have risen up from below, have cooled from a melted state more rapidly upon or near the surface. See GRANITE.

PLUTUS, in ancient mythology, the god of riches, son of Ceres and of Iasius. He was reared by the goddess of peace, and in Athens there was a statue of Pax holding Plutus in her arms. He was represented as blind, and as distributing his gifts among good and bad indiscriminately. A legend assigned the caves of Spain to him as a residence, that country being noted for its deposits of precious metals.

PLYMOUTH, a co. in n.w. Iowa, adjoining S. Dakota, bounded on the w. by the Sioux river, drained by Floyd's river and the w. fork of the Little Sioux; on the Chicago, St. Paul, Minneapolis, and Omaha, and the Illinois Central railroads; about 818 sq. m.; pop. '90, 19,568, chiefly of American birth. The surface is diversified, and the soil fertile. Corn, oats, and wheat are the principal productions. Co. seat, Lemars.

PLYMOUTH, a co. in s.e. Massachusetts, having the Atlantic ocean and Cape Cod bay for its e. boundary, Buzzard's bay for its s., and Massachusetts bay for its n.; drained by the Namasket river and other small streams forming the head-waters of the Taunton river; 671 sq.m.; pop. '90, 92,700, chiefly of American birth, incl. colored. Its surface is hilly, and wooded with forests of oak, pine, maple, birch, hickory, walnut, ash, elm, and poplar trees. It is drained by several large inland lakes; Monponsett, in Halifax, 743 acres; Arsawampsett, in Lakeville, 2,220 acres; Long, 1760 acres; Great Quitticas, 1255 acres; and others of less area. It has many good harbors, and its coast for the most part is well protected. It is intersected by several divisions of the Old Colony railroad. In the s.e. section a neck of land between Cape Cod bay and Buzzard's bay connects this co. with the co. of Barnstable, Cape Cod district. It is through this neck of land that a canal is being constructed, to provide safe and rapid transit for ships to and from Boston. Its soil is sandy and rocky in many portions, but in all is susceptible of cultivation. Much attention is paid to farming and market gardening, an agricultural fair being held annually in the town of Bridgewater. Its industries include the manufacture of boots, shoes, and brogans, boxes, nails, iron in various forms, hardware, harnesses, cotton gins, furniture, cotton, woolen, and straw goods, shovels, metallic wares, cordage, lumber, rolled zinc, etc. It has always held commercial relations with the extreme south in connection with cotton and its manufacture. Co. seat Plymouth.

PLYMOUTH, town, port of entry, and co. seat of Plymouth co., Mass.; on Plymouth bay and the New York, New Haven, and Hartford railroad; 37 m. s.e. of Boston. This, the first permanent settlement in New England, was founded in 1620 by the Pilgrim fathers, who came hither in the *Mayflower*, and on Dec. 21, landed on a granite bowlder, still preserved, and widely known as Plymouth rock. The early history of the emigrant church of which they formed a part is told in the article ROBINSON, JOHN, (q. v.). The first recorded act of Plymouth as a town is dated 1633. The town is the largest in the state; stretches along the coast for 18 miles, and has a width from 5 to 9 miles. It contains many small lakes or ponds, the largest of which, Billington sea, has an outlet called Town brook, on which some of the mills are situated. The town is built on several hills rising gradually from the beach, the houses standing compactly on beautifully shaded streets, with concrete walks. It has a large but shallow harbor, protected by a beach with a sea-wall 3 miles long, running n. and s., separating the harbor from Cape Cod bay. The depth of the water at high tide will admit vessels of 12 ft. draught, at low tide those drawing 6 ft. The sea-wall was built by the Plymouth beach lottery, the last lottery tolerated in the state. Adjacent to the breakwater is Clark's island, where the Pilgrims spent their first Sabbath, now becoming popular as a summer residence. Near by is the Gurnet light, and opposite this is Manomet bluff and hills, and a popular resort for sportsmen. The court house contains the registry of deeds, with the earliest records of the colony, the original patent to the company, granted 1629, from the earl of Warwick, the plan of the town, the order for the first jury trial, etc. The town has a house of correction, a town hall, several churches, a soldiers' monument, an Odd Fellows' hall, Masonic and Good Templars' lodges, and a grand army post. It has numerous private and public schools, and a public library; national and savings banks and weekly newspapers. The leading industries, besides a number of vessels employed in the fisheries, and some commercial business, are the manufacture of woolen goods, cordage, boots and shoes, cotton goods, duck, stoves, rivets, nails, and tacks, steel shoe shanks, kegs, boxes, barrels, etc. The manufactories utilize the extensive water-power which the river affords. The national monument to the Pilgrims is 81 ft. in height; the corner-stone was laid in 1859, the monument dedicated 1889. The monument was designed by Hammett Billings, cost $200,000, and consists of a granite pedestal, with four large and four small faces, 45 ft. high, and surmounted by a granite statue of *Faith*, 36 ft. high, which cost $32,000, and was presented by Oliver

Ames. Statues of *Morality*, *Law*, *Freedom*, and *Education* were presented by the state of Massachusetts, the legal fraternity of the United States, the U. S. government, and Roland Mather respectively. Pilgrim hall contains valuable relics, books, furniture, pictures, etc. The portion of the rock which, having been accidentally split off in 1774, was enclosed by an iron railing in front of the hall, in 1834, has been replaced on the original bowlder in Water st., which is covered by a granite structure supported by 4 columns. In the top of this are the bones of some of the original settlers, removed from Coles's Hill. The railing which once enclosed the fragment of rock, now guards a tablet on which is cut the compact; the names of the signers having been long inscribed on the "heraldic curtains" at the tops of the iron bars. Within the hall are Edgar Parker's copy of Weir's "Embarkation;" "The Landing," by Henry Sargent; and portraits of the early settlers, among them Ephraim Spooner, town-clerk 51 years, and Alcock's copy of the portrait of sir Walter Raleigh, 1775; also a representation of the ship lying at Delfthaven awaiting the departure on July 22, 1620, painted by Charles Lucy, 1846, which received in 1848 the prize of £1000 given by the British government at the Westminster exhibition. On Burial hill are the graves of Carver, Bradford, etc., and the stones which mark the site of the old forts and the brick watch-tower, 1643. Coles's hill, where many of the first settlers were buried, was occupied by a battery in 1742, and by a fort in 1775, and in 1814. Plymouth has electric lights, electric street railroads, waterworks supplied partly by gravity and partly by pumping, and Monument and Morton parks. Pop. '90, 7,314.

PLY'MOUTH, an English sea-port and market t., and a parliamentary and municipal borough in the s.w. of Devonshire, 246 m. w.s.w. of London. It stands in the bight of Plymouth sound (q.v.), between the estuaries of the Plym and Tamar. To the w. of it is Stonehouse (q.v.), a township and coast-guard station, and still further w. is Devonport (q.v.), the great naval and military station. The two former places, however, having become united by continuous lines of houses, have lost their individuality, and are (with Devonport, which is walled, fortified, and surrounded by a moat) now generally considered as one great town. Of this great center of fashion, trade, and naval and military preparation, Plymouth proper, which covers an area of 1 sq.m., may be called the city, and Devonport the west end; while Stonehouse is an intermediate district, containing chiefly factories, barracks, victualing yards, hospitals, and other institutions. Plymouth proper extends from Mill bay on the w. to the mouth of the Plym on the east. Its site is somewhat rugged and uneven; an eminence forming the suburbs runs along its n. side, and another eminence, partly occupied by the citadel, fronts the sound. The chief buildings are the Royal hotel, comprising an immense inn, assembly-rooms, a theater, and the athenæum, all partially destroyed by fire in 1862, and rebuilt in 1863; public library, containing in its Cottonian collection 300 sketches by the old Italian masters; St. Andrew's church, the tower of which dates from 1490; and Charles church (1646–58), dedicated, with fervent loyalty, at the restoration, to "St. Charles the Martyr." There are also several important educational establishments, some of which are endowed, as well as many charitable institutions. Guild hall is a group of Gothic buildings with a high tower. The city contains an arsenal, a dock-yard, and other government buildings. Mill bay and Sutton pool are two small inlets of the sound, in which lie all the merchant-vessels bound for Plymouth proper. Between these inlets, and running along the shore, is the eminence or high plateau of land called the Hoe. From this ridge, whence the approach of the Spanish Armada is said to have been first descried, magnificent shore and sea views may be obtained. Its eastern end is occupied by the citadel, which commands the entrance of the Cutwater (the lower estuary of the Plym), and of Sutton pool. Mill bay, on the w., is so deep that vessels of 3,000 tons can lie at the pier at low water. Here are the important Great Western docks, covering an area of 14 acres, and having a depth of 22 ft., constructed about the years 1855–58. Close to these docks, and connected with them by a tram-line, are the termini of the South Devon, Tavistock, and Cornwall railways. The principal exports are lead, tin, copper, and granite; imports, agricultural products and timber.

Plymouth, described by Leland as being, in the reign of Henry II., "a mene thing, an inhabitation of fishars," was called by the Saxons, Tameorworth (town on the Tamar); after the Conquest it was called Sutton (south town); and it was not till the reign of Henry VI. that it received the name of Plymouth (mouth of the Plym). During the 14th and 15th c. it was frequently attacked and set on fire by the French, and in 1512 an act was passed for the strengthening of its defenses, which since then have greatly increased, until now the whole shores of the sound are well defended by cannon, and a cordon of inland forts has been of late years constructed at immense cost, surrounding the three towns at a distance of from two to three miles. Pop. '91, 84,200.

PLYMOUTH, a borough in Luzerne co., Pa.; on the Susquehanna river and the Delaware, Lackawanna, and Western, and the Delaware and Hudson railroads; 3 m. n.w. of Wilkesbarre. It has electric lights and street railroads, national bank, over 15 churches, several public schools, waterworks supplied chiefly from spring brooks, and manufactories of hosiery, drilling machines, etc. The principal industry is coal mining. Pop. '90, 9,344.

PLYMOUTH BRETHREN, a religious sect which sprang into existence about 1830–35 in Plymouth, Dublin, and other places in the British islands, and which has extended itself considerably throughout the British dominions and in some parts of the continent of Europe, particularly among the Protestants of France, Switzerland, and Italy, and also in the United States of America. It seems to have originated in a reaction against exclusive high church principles, as maintained in the church of England, with everything of a kindred nature in other churches, and against a dead formalism associated with "unevangelical" doctrine. Many of the first members of the new religious communities formed in Plymouth and elsewhere were retired Anglo-Indian officers, men of unquestionable zeal and piety; and these communities began to appear almost simultaneously in a number of places. Their origin is, however, very much to be ascribed to the labors and influence of Mr. Darby, from whom the Plymouth brethren on the continent of Europe are very generally known as *Darbyites*. Mr. Darby was a barrister, moving in the highest circles of society; and under deeply religious impressions, became a clergyman of the church of England, and lived for some time in a mud hovel in the county Wicklow, devoting himself to his work; but afterward left the church of England from conscientious scruples, and became an evangelist unconnected with any church. In this character, he labored both in England and on the continent of Europe, preaching in French, English, and German. He also gave utterance to his opinions in numerous pamphlets, and in a quarterly periodical called *The Christian Witness*, which for a number of years was the "organ" of the Plymouth brethren. He continues to visit from time to time the communities or meetings of Plymouth brethren. His tenets, and those of the Plymouth brethren in general, are strictly Calvinistic: original sin and predestination, the efficacy of Christ's sacrifice, the merit of his obedience, the power of his intercession, the gracious operations of the Holy Spirit in regeneration and sanctification, are prominent points. Millenarian views are also generally entertained by the Plymouth brethren; and they usually practice the baptism of adults without regard to previous infant baptism. They acknowledge the sacrament of the Lord's-supper, and administer it to one another in their meetings, usually on every Sunday, or "first day of the week;" in this, as in everything else, refusing to acknowledge any special ministers. They utterly reject confirmation. Their most distinctive peculiarity, when contrasted with other Calvinistic churches, is their complete rejection of ecclesiastical organization. They suppose the whole Christian body in the world to have declined from truth and duty, like Israel of old, and, therefore, to have been "corporately rejected of God," and believe the true church to consist of themselves and of other chosen ones in the various Christian churches. They refuse to recognize any form of church government, or any office of the ministry; they insist much on the equal right of every *male* member of the church to prophesy or preach; and in their meetings, after each hymn or prayer, there is usually a pause, that any one, moved by the spirit, may undertake this office. They exclude persons known to have been guilty of gross sins from participation with them in the Lord's-supper, until proof is afforded of repentance. The Plymouth brethren reject every distinctive appellation but that of Christians; although a special denomination is found necessary to designate them; and, in fact, no one not holding their views could remain associated with them. A great schism took place among them in consequence of doctrines preached at Plymouth and Bristol concerning the human nature of Christ; Mr. Darby vigorously opposing what he deemed a dangerous error, and he and his adherents utterly separating from the fellowship of those who maintained or even refused to condemn it. One of the most noted (if not notable) converts to the principles of the sect was the revivalist Guinness, who was baptized in 1860 by another Plymouth brother, lord Congleton. There are about 100 meetings in the U. S., and 100 in Canada.

On the continent of Europe, the Plymouth brethren have in many places given great trouble to the Protestant churches, by their opposition to all ecclesiastical order or organization. See Mrs. H. Grattan Guinness's *Answer to the Question: Who are the Plymouth Brethren?* (Philadelphia, 1861.) For hostile criticisms, see Carson, Reid, and Croskery.

PLYMOUTH SOUND, a well-known roadstead on the s.w. of Devonshire, important as a naval station, has considerable claims to the distinction of being called, as it frequently has been, the most beautiful estuary on the English coast. Its position at the entrance of the English channel is much in its favor. It is two and a half miles wide, and extends inland for three miles. It penetrates into the country by means of the harbors of Hamoaze and Catwater, the estuaries of the Tamar and Plym respectively. On its w. side is Cawsand bay. The shores, which present many beautiful views, rise in hills of from 100 to 400 ft., and are dotted over with woods and with villages, and bound by coasts which are generally rocky and abrupt. Mount Edgecombe park, the beautiful seat of the earl of Mount Edgecombe, occupies the w. shore of the sound. At the mouth of the Tamar is the small island of St. Nicholas, or Drake's island, a pyramidal rock strongly fortified. The sound is open to the s.w., from which direction strong winds frequently blow, and violent surges are thrown in from the Atlantic. In order to protect the shipping in the harbor, a massive stone breakwater, 1700 yards in length, was constructed at a cost of about £1,500,000, and completed in 1841. See Breakwater. On a sunken rock just inside the breakwater and at its center, a strong stone fort has been within recent years erected; and an extensive series of stone batteries has been erected

at Bovisand and Picklecombe on the mainland, on either side of the entrance to the harbor. Fourteen m. s.s.w. of Plymouth is Eddystone light-house. See EDDYSTONE.

PNEUMATIC DISPATCH. This name is given to a mode of sending parcels, mail-bags, or telegram papers through a tube by atmospheric pressure, or by a partial vacuum. Early in the present century, Mr. Medhurst conceived the idea of some such contrivance. He proposed to construct air-tight tunnels, with carriages moving through them on rails; and these carriages were to be propelled by compressed air from behind, or else by suction in virtue of a vacuum formed in front of them. Medhurst was laughed at by his contemporaries as a visionary; but his speculations were called to mind in later years, and led to the attempts noticed under ATMOSPHERIC RAILWAY.

In 1861 was announced a *pneumatic dispatch* project, based on a reconsideration of the causes of failure in the earlier schemes. The conveyance of passengers and of bulky goods was not here contemplated; parcels and mail-bags were the articles held chiefly in view. To test the theory, a quarter of a mile of iron tube was experimentally laid down near Battersea, with a fair average of gradients and curves purposely given to it. The tube was about 30 in. in diameter; and it was found easy to propel a train through the tube consisting of two iron carriages of 7 cwt. each, at a rate of 30 m. an hour.

After many financial discouragements, a *pneumatic dispatch company* obtained capital in 1862, and began operations in 1863. The experimental tube was removed to London, and laid down beneath the roadway of Seymour street, Euston square, from the Euston station of the London and North-western railway to the n.w. district post-office in Eversholt street—a distance of one-third of a mile. Mail-bags being successfuly transmitted in this way, the company commenced in 1864 the construction of a tube on a larger scale, and this has since been completed. The tube is laid down from Euston square to St. Martin's-le-Grand, by way of Tottenham court road, Holborn, and Newgate street—a distance of 2¾ miles. The tube is of large size, nearly 4½ ft. in diameter, laid down at as small a depth beneath the carriage-way of the several streets as the water and gas pipes will permit. It is chiefly of cast-iron; but some portions on a sharp curve are of brick. There is a large engine-house on the s. side of Holborn, near Lincoln's Inn Fields, to supply all the power for working the whole tube in both directions. Rarefied air in one-half of the tube draws a train of iron carriages, laden with parcels and mail-bags, from Euston station to Holborn; and compressed air drives them through the other length of tube from Holborn to the general post-office—there being suction in the one case, and pressure in the other. A reverse action brings trains in the other direction. The necessary amount of rarefaction in the one case, and of compression in the other, was determined by experiment; but both are produced by means of a revolving fan of peculiar construction and large dimensions worked by a powerful steam-engine at the Holborn station. If this mode of transmission were to come into general use, there would be great saving of time in the delivery of letters and parcels, and a material lessening of the number of parcels and mail vans and carts in the overcrowded streets of the metropolis. It is to be regretted that a work so successful in a scientific and engineering point of view should still remain undeveloped in a commercial sense. The postmaster-general, the railway companies, and the great carriers, have made no practical working engagements with the pneumatic dispatch company; and this costly tube, with the engine-house in Holborn, has now remained silent and unused for several years. This of course has checked any extension of the system into other districts. We cannot resist the conviction that a better result will present itself sooner or later.

The problem of *passenger* conveyance within a pneumatic tube was shown to be practicable by Mr. Rammell, in an experiment tried at the crystal palace in 1864; but nothing further has been done in the matter.

More success has attended the introduction of a system for transmitting small rolls of paper through tubes of a few inches diameter, by pneumatic pressure. Mr. Siemens introduced it at Berlin; it was next tried with success at Paris; Mr. Latimer Clark constructed similar apparatus in London; and the plan is now in regular use in the telegraph department of the new buildings connected with the general post-office in St. Martin's-le-Grand, while it is also used in some of the chief provincial cities and towns. In 1875 the number of tubes in London was 24, with an aggregate length of nearly 18 m.; there were 4 tubes in Liverpool; 3 in Dublin; 5 in Manchester; 3 in Birmingham; and 1 in Glasgow. Small tubes, two or three inches in diameter, are arranged for the reception of telegraph forms or papers, made up into a roll, and put into a felt cylinder. The purpose is to economize time and expense in conducting the government postal telegraph business by *blowing* along the telegraph forms at a rate of 30 m. an hour, instead of sending them by street conveyance. Two parallel tubes have been laid down beneath the pavements of the streets from the general post-office to various parts of London, and also in some of our large provincial cities and towns; additions being made to the length of tube according as the system becomes practically developed. One tube in each pair may be called the down line, the other the up; the two are placed in connection at each end, and one steam-engine works them both. The felt cylinder very nearly fills up the tube, but still moves easily along it; this movement is brought about either by the formation of a partial vacuum in front of the cylinder, or by compressing the air behind it; and the steam-power is so applied as to produce either or both of these two results,

according as convenience may suggest. An ingenious plan is adopted for accommodating one or more intermediate offices, just as local stations are accommodated between the two termini of a railway. The cylinder or *carrier* travels from end to end of the tube, unless a block or check action is purposely put in force at an intermediate station; and the mode of effecting this is one of the most beautiful of Mr. Siemens's inventions relating to the subject. Two pieces of pipe, the *receiver* and the *transmitter*, are made exactly alike, and are so pivoted together that either may be adjusted into a cavity cut in the tube, and made temporarily to form part of it. The carrier, we will suppose, is intended to stop at the intermediate stations, to admit of the removal of some telegram papers and the introduction of others. A click is heard; the carrier strikes against an obstruction in the receiver; the cavity is opened; the exchange of papers is made; the carrier is re-introduced, but into the transmitter instead of the receiver; the cavity is closed again, and the carrier resumes its journey. All this is the work of a few seconds merely. If the intermediate station has nothing to send and nothing to receive, the transmitter alone is used, and the carrier travels on without stopping. The up-tube and the down-tube have each its apparatus of receiver and transmitter. The felt cylinder and its contents being very light, a slight rarefaction of the air in front of it, or condensation of the air behind it, is sufficient to produce a speed equal to twenty or thirty m. an hour. Within recent years pneumatic tubes have come into extensive use in large stores for transmitting small parcels, money &c., between different departments in the same building.

PNEUMATICS (Gr. *pneuma*, spirit or breath, air) is the science which treats of the mechanical properties of aeriform fluids, such as their weight, pressure, elasticity, motion, etc. The great representative of the aeriform fluids is the atmosphere. The atmosphere is very frequently called "air," to distinguish it from the others, which are known as "gases." The fact of air having weight, and generally exercising pressure and resistance, was unsuspected by most of the ancients, though they were aware of the latter property in particular cases, from seeing and feeling the effects of the wind; but the idea that air in a state of rest exerts pressure on a body immersed in it, never seems to have occurred to them. Aristotle, however, asserted that air had weight, and so did several subsequent philosophers; but the truth of this opinion was not established till the time of Torricelli (q.v.), who not only showed that it had weight and exerted pressure, but also found the amount of this weight or pressure. See ATMOSPHERE. Pascal (q.v.) completed the investigation, and invented the barometer (q.v.). The experiments of these philosophers proved that what is called "suction" is nothing more than an effect of the pressure of the air on one side of a body, unbalanced by an equal pressure of air on the opposite side of it. To this property of air we owe the working of the various kinds of pumps (q.v.), the barometer (q.v.), the siphon, cupping-glass, etc. But the great distinguishing feature of aeriform bodies is the repulsive force which their molecules exercise over each other, and the constant expansion of these bodies when pressure is removed, or compression when pressure is increased. The investigation of the expansibility and compressibility of air was carried on by means of the air-pump (q.v.), an invention of Guericke (q.v.), and soon resulted in the discovery of a law by Boyle (about 1650), and Mariotte (1676), called *Mariotte's law*, (q.v.), which affirms, that "at a given temperature the volume of a gas is inversely as the pressure." See GASES. The second great law of tension and pressure is that of Dalton and Gay-Lussac (1801), which states, that "when the tension remains the same, the density of a gas varies inversely as the temperature"—that is to say, when the temperature is increased by equal increments, the bulk is increased by equal increments. The motion of gases is subject to the same laws with that of liquids, the laws which regulate the motion of liquids depending for their efficacy not on the liquidity, but on the fluidity (see FLUID) of these bodies. The flow of gases in tubes seems to be retarded by friction against the sides, in the same way as that of water is, and the diminished efflux at an orifice shows that the *vena contracta* exists for gases as well as for liquids. Abundance of examples and further explanations of the properties of air will be found under such heads as ATMOSPHERE, BALLOON, BAROMETER, DIVING-BELL, MAGDEBURG HEMISPHERES, etc.

PNEUMATIC TROUGH is a piece of chemical apparatus originally devised by Priestley, and now in daily requisition in every laboratory. By its means gases can be collected in vessels for experiments or examination, and can be decanted from one jar to another with as much ease as if we were dealing with liquids. The pneumatic trough consists of a vessel of water, provided with a ledge or shelf at the depth of 2 or 3 in. from the top. The jars in which the gas is to be collected are filled with water and placed with their mouths downward upon the shelf, which is kept a little under water, so as to prevent the entrance of air into the jars. When the edge of the jar is brought over the extremity of the tube carrying the gas, the bubbles of gas rise through the water, collect in the upper part of the jar, and displace the liquid. As soon as a jar is filled, it may be removed by sliding under its open mouth while still under water, a plate or tray containing enough of water to cover the edge of the jar; and oxygen and many other gases may be thus preserved for hours. Another jar full of water is substituted for the removed jar. The trough is best constructed of japanned copper, and may be made of any size corresponding to that of the jars; and in the shelf a groove should be

made about half an inch in width, and the same in depth, to admit the extremity of the gas-delivering tube beneath the jar.

PNEUMOGASTRIC NERVE, or *Par Vagum*, derives the first of its names from its supplying the lungs and stomach with nervous filaments, and the second from the wandering course which it pursues. It emerges from the medulla oblongata by eight or ten filaments, which unite and form a flat cord that escapes from the cavity of the cranium (in association with the glossopharyngeal and spinal accessory nerve) by the jugular foramen. In this foramen it forms a well-marked ganglionic swelling, while another is observed immediately after its exit from the skull. The nerve runs straight down the neck between and in the same sheath as the internal jugular vein and the carotid artery. Below the root of the neck its course is different on the two sides; the right nerve running along the back of the œsophagus is distributed to the posterior surface of the stomach, and finally merges into the solar plexus; while the left nerve runs along the front of the œsophagus to the stomach, sending branches chiefly over its anterior surface.

From anatomical considerations, based on the distribution of this nerve, and from the results of experiments on animals, it may be concluded that this is a mixed nerve, containing filaments both of sensation and motion. The pulmonary branches exercise a most important influence upon the respiratory acts, for when the pneumogastrics on both sides have been divided above the giving off of the pulmonary branches, the most severe dyspnœa comes on, the number of respirations is much diminished, and the animal breathes as if it were asthmatic; after a short time the lungs become congested and dropsical, and the bronchial tubes filled with a frothy serous fluid: and if the cut ends of the nerves are kept apart, the animal never survives above three days. The gastric branches influence the movements of the stomach, while their destruction does not materially affect the secretion of the gastric juice or the process of chylification. Loss of voice and difficulty of breathing have been frequently traced to the pressure of an aneurism or other tumor on the recurrent or inferior laryngeal. Whooping-cough is ascribed by many high authorities to an affection of the pneumogastric nerve; and the violent spasmodic cough which accompanies enlarged bronchial glands is probably due to the irritation of its pulmonary branches. The sympathy which exists between the digestive and the respiratory and circulating organs is explained by the anatomical relations of this nerve. For example, both asthma and palpitation of the heart are often to be traced to some deranged state of digestion. Vomiting may be excited by irritation of the central or the distal extremities of the nerve. In disease of the brain the vomiting, which is often an early symptom, is caused by irritation of the central extremity; and in sea-sickness it is that extremity also which is irritated by the disturbed state of the circulation in the cranium; while by introducing emetic substances into the stomach the vomiting is produced by the irritation of the peripheral (or distal) filaments.

PNEUMONIA, or inflammation of the substance of the lungs, is a disease which is divided by pathologists into three distinct stages, corresponding to different degrees or periods of inflammatory action. The first stage is that of *engorgement*, in which the lung or a portion of it is gorged with blood, is of a darker color externally, and crepitates (or crackles) less under pressure than healthy lung does; the air that ought to exist in the pulmonary cells being in a great measure replaced by fluid. On cutting the engorged portion the section is seen to be redder than natural, and to yield a great quantity of reddish and frothy serum. The most engorged portions will generally float in water, although they are heavier than healthy lung. If the inflammation continues, new characters appear. The affected portion of the lung ceases to crepitate under pressure, and sinks when placed in water, in consequence of its now containing no air. The spongy character of the lung is gone. It is now solid, and the cut surface so closely resembles that of liver that the term *hepatization*, first suggested by Laennec, is generally applied to this stage. On examining with the microscope a torn fragment of the hepatized lung, it will be seen to be composed of small red granulations pressing upon one another, which are doubtless the air-cells clogged up, thickened, and made red by the inflammation. In the third and most advanced stage the pulmonary tissue remains, as in the last stage, dense, solid, and impervious to air; but its section, in place of being red, is now of a reddish-yellow, or straw, or drab, or stone color, or is of a grayish tint, and the little granulations which were red in the second stage are now whitish or gray, from the presence of pus or matter which permeates through the pulmonary tissue, rendering it very soft and friable. To this stage, which is in reality one of *diffused suppuration*, Laennec applied the terms *gray hepatization*, or *purulent infiltration*. Besides revealing to us the above information regarding the changes which the pulmonary textures undergo in the three stages of this disease, morbid anatomy teaches us that inflammation does not attack all parts of the lung on both sides indiscriminately. It is much more common on the right side of the body than the left. Of 210 cases collected by Andral, 121 were on the right lung alone, and 58 on the left side alone; while in 25 it was double (i.e., occurred in both lungs), and in six the seat was uncertain; so that pneumonia is more than twice as common on the right side as on the left, and only occurs on both sides together as often as once in eight times. According to Grisolle, however, whose *Traité Pratique de la Pneumonie* is the standard work on this disease, the relative fre-

quency with which the right lung is affected is rather less than two to one (11 : 6). Moreover, pneumonia is considerably more common in the lower than in the upper lobes of the lung—a point of great importance in diagnosis. Of 88 cases observed by Andral, the inflammation was found to affect the lower lobe 47 times; the upper lobe, 30; and the whole lung at once, 11. Inflammation of the bronchial tubes so constantly accompanies inflammation of the tissues of the lung, that although bronchitis often exists without pneumonia, pneumonia never occurs without bronchitis. Moreover, a certain amount of pleurisy or inflammation of the investing membrane accompanies pneumonia in a very large majority of cases.

The alterations which take place in the tissue of the lung give rise to important modifications of the ordinary sounds yielded by auscultation and percussion, the discrimination of which, however, belong to the physician.

The following are the general symptoms, as distinguished from the physical signs, of pneumonia: The disease generally commences with inflammatory fever; and pain in the side, due to pleurisy in most cases, soon supervenes. The breathing is always more or less affected, especially when the upper lobe is inflamed. According to prof. Gairdner, the dyspnœa of *pure* pneumonia is a mere *acceleration* of the respiration, without any of the heaving or straining respiration observed in bronchitis, or in cases where the two diseases are combined. Delirium is a very frequent and always a dangerous symptom, indicating that the due arterialization of the blood is much interfered with, and that the impure circulating fluid is affecting the brain. The cough is usually dry at first, but in a few hours it is accompanied by the expectoration of sputa of so characteristic a nature as to afford almost certain evidence of the presence of the disease. On the second or third day the expectoration, which previously consisted merely of a little bronchial mucus, consists of transparent and tawny or rust-colored sputa, which unite in the vessel containing them into one gelatinous mass. The color is owing to the complete blending of the blood and mucus, and in proportion to the quantity of the former the sputa is more or less deeply tinged. So long as the expectorated matter flows readily along the side of the vessel when it is tilted, there is reason to believe, unless physical signs tell us otherwise, that the inflammation is still in the first stage; but when the sputa are so viscid that the vessel may be inverted and strongly shaken without their being detached, there is reason to fear that the pneumonia has reached the second stage. If improvement now commences, the sputa becomes less tenacious, less rust-colored, and gradually like the expectoration of common catarrh. But if the disease advances, the rust-colored sputa, although in less quantity, may go on to the end; or there may be no expectoration, either on account of its own tenacity or of the patient's want of power to eject it, in which case the air-passages get gradually filled and death from suffocation occurs; or there may be the expectoration of a fluid of the consistence of gum-water, and of a brownish-red color (resembling prune-juice), which, according to Andral, affords strong evidence that the disease is in its third stage; or, lastly, pure pus may be excreted during the third stage.

In its first and second stages this disease is tolerably amenable to treatment. Whether when the lung has reached the third stage it is still susceptible of repair we cannot tell, because we have no certain sign of the commencement or establishment of this third stage during life, although we may guess that it is established if the face has become very pale and corpse-like; if there is the prune-juice or purulent expectoration; and if the disease has lasted for a sufficient time to have advanced so far, although it would be very difficult to state, with any approach to accuracy, what the necessary time is. The average duration of pneumonia may be placed at ten days or a fortnight.

Of the causes of this disease very little need be said. Sometimes no cause can be traced. Very often it is the consequence of exposure to cold, especially when the body was previously heated by exercise; but why such exposure should in one person cause pneumonia, in a second pleurisy, in a third, pericarditis, and in a fourth, peritonitis, we cannot tell.

The following is a brief outline of the treatment to be adopted, provided the patient was previously strong and healthy: In the first stage, free venesection, tartarized antimony (one-third of a grain to half a wine-glassful of water every hour, and the dose to be increased to a grain or more hourly, if there is no purging or vomiting, which may often be prevented by the addition of a few drops of laudanum to each dose), and antiphlogistic regimen generally are of service. Under this system there are often signs of improvement in five or six hours, although sometimes there is no change for the better till 24 hours or more have elapsed. When the disease has reached the second stage, in preference to continuing the antimony we should as speedily as possible get the system gently under the influence of mercury, in the mode recommended in the articles Pericarditis and Peritonitis. If there is great depression of the vital powers, as indicated by a feeble and irregular pulse, and the other ordinary signs of sinking, it will be requisite to administer stimulants, such as wine and carbonate of ammonia, and to feed the patient on beef-tea.

There are few diseases in which it is of greater importance to watch the patient during convalescence than in pneumonia. The convalescence is often rather apparent than real, and, as Dr. Watson truly observes, "a patient can never be pronounced perfectly secure so long as any trace of crepitation remains in the affected lung, and this

may often continue long; nay, it not unfrequently ceases only on the supervention of another more surely fatal though less rapid disorder, viz., tubercular consumption."

PNYX. See ATHENS.

PO (anc. *Eridanus* and *Padus*), the largest river of Italy, rises in two springs on the n. and s. sides of Monte Viso, one of the Cottian Alps, close to the French frontier, and in lat. about 44° 40′ north. It flows eastward for upward of 20 m., when, arriving before Saluzzo, it emerges from its rocky defiles and enters upon the plain. From Saluzzo it flows n.n.e. past Turin, and arriving at the town of Chivasso it changes its course toward the e., in which direction it flows to its embouchure in the Adriatic. Upward of 50 m. above its mouth it begins to form its delta, the principal branches being the *Po della Maestra* on the n., and the *Po di Primaro* on the south. The unhealthy marsh of the *Valli de Comacchio* extends immediately n. of the Primaro branch. The Po receives from the left the Dora Riparia, Dora Baltea, Sesia, Ticino, Adda, Oglio, and Mincio; from the right the Maira, Tanaro, Trebbia, Taro, Parma, Secchia, and Panaro. At Turin the Po is about 750 ft. broad; at Pavia, 1050 ft.; at Cremona, 2650 ft.; and below Polesella, after throwing off the Po di Primaro branch to the s., its breadth is about 850 feet. It has an entire length of 418 m., is navigable for small barges 60 m. from its source, and drains an area of 26,800 sq. miles.

POA. See MEADOW GRASS.

POACHING, though not strictly a legal term, has in England been appropriated in popular parlance to describe a well-known legal offense, and it is now usually adopted in legal works. It means the unlawfully trespassing on another's lands for the purpose of catching or pursuing game; and it is likewise extended to the cognate offense of unlawfully catching or pursuing fish in another's waters.

1. *As to poaching game.*—The general law as to who is entitled to game, and in what circumstances, is stated under the head GAME LAWS. As a general rule, whoever is the proprietor of land is the only person exclusively entitled to catch and kill the game; and where the land is let to a tenant, then, in England and Ireland, if nothing is said or agreed on the subject, it is the tenant, and not the landlord, who is entitled exclusively to the game. In Scotland the rule is the reverse, for the landlord, and not the tenant, is there entitled to the game; but generally there is an express stipulation in leases, providing for this somewhat important right. As regards hares and rabbits, however, the law was altered for the whole United Kingdom by the ground game act of 1880, which gives to every occupier of land an inalienable right, jointly with the proprietor, to kill such ground game under certain restrictions, as to the method of killing and the number of persons entitled to kill. The right of the occupier under this act cannot be transferred. By the so-called day-poaching act (1 and 2 Will. IV. c. 32, s. 30), whoever unlawfully goes upon lands not his own to pursue or kill not only game, but also rabbits, woodcocks, snipes, quails, and land-rails, is liable to a penalty of £2. It has been held that this offense is committed whenever a stranger has *de facto* gone upon the lands to shoot without having previously expressly obtained the permission of the party entitled to the game, even though he may have had good reason to believe that such permission, if asked, would have been granted as a matter of course, and though, after hearing of the trespass, the owner quite approved and ratified it. Moreover, any person whatever, whether interested in the lands or not, may institute the proceedings for the punishment of the poacher; and the informer is entitled to half the penalty, the other half going to the poor of the parish. When a poacher is found trespassing on lands in search of game, the person entitled to the game there, or the tenant, or a gamekeeper, or servant of either, may demand the poacher's name and place of abode, and if it is refused, may arrest such poacher, and take him before a justice of the peace; but the poacher must be taken within twelve hours before the justice, otherwise he is entitled to go at large. It is only the persons named (and not any one of the public, or even a constable) who can arrest the poacher, and it can only be done when he is caught in the act on the very lands; for if the poacher clear the fence, and go on to other lands, he cannot then be arrested at all. If game is found on the poachers at the time they are caught, and it appear to have been newly caught, the party who is entitled to arrest him is entitled to seize the game also. If the poacher when convicted do not pay the penalty within the time fixed by the justices, he may be committed to the house of correction for a period not exceeding two calendar months. The party may appeal against his conviction to the court of quarter sessions; but he must either remain in custody in the interval or give security for the costs. The offense of poaching is punished more severely when five or more go out together, showing thereby an attempt to intimidate gamekeepers and others, and in such case each is liable to a penalty of £5. Moreover, if any of these five or more persons, acting in concert, be armed with a gun, and use violence, each is liable to an additional penalty of £5. As to the night-poaching act (9 Geo. IV. c. 69) it is provided that any person by night—i.e., between the first hour after sunset and the first hour before sunrise—unlawfully trespassing in search of game, shall for a first offense be committed by the justices to the house of correction for three months, or in some cases for six months; for a second offense, shall be committed for six months, or in some cases for twelve months; and for a third offense shall be guilty of a misdemeanor, and be imprisoned for two years. In case such night-poachers are found on the lands and in the act, the owner

or occupier of the land or his servants may arrest the poachers and take them before justices. If the night-poacher, when arrested, use fire-arms, sticks, or offensive weapons he shall be guilty of a misdemeanor, and be punishable by two years' imprisonment in addition. In case of three or more night-poachers being armed with guns, bludgeons, or other offensive weapons, each is guilty of a misdemeanor, and is liable to imprisonment for three years. Poachers have no right to kill game on the highway any more than in fields or inclosures, for the owners of the adjoining land are entitled to the game on the highway. Under the former law it was, as already mentioned, incompetent for any person except the owner or occupier of the lands to apprehend the poacher, and even this could only be done when the poacher was caught in the act on the lands themselves; and hence, even constables had no power to seize the poacher, though seen to be coming from such lands. But by the recent poaching prevention act (25 and 26 Vict. c. 114), which applies to the United Kingdom, if a constable now meet a suspected poacher on the highway, whom he has reason to suspect of coming from land where he has been poaching, such constable may stop and search the poacher; and if game, or implements for taking game, are found on him, may seize and detain them, and summon him before the justices. When before the justices, if it be proved by circumstantial evidence or otherwise that such game was procured by poaching, or that the implements were used, the poacher may be fined in a penalty of £5, besides forfeiture of the game, and guns, nets, and other implements which he may have so used. The person convicted may appeal if he chooses to the next quarter sessions, or, in certain cases, to the court of queen's bench. With regard to the poacher's property in the game he kills, it is only in those cases where he is caught in the act, and on the spot, that the game can be taken from him; and this, for obvious reasons, seldom happens. In all other cases the general rule applies that whoever first catches (whether legally or illegally) a wild animal, is entitled to the property in it; and as game is in the category of wild animals, the poacher is entitled to keep the game, except where it was both started and caught on one and the same person's lands. The law of Scotland does not materially differ from that of England as to poachers; and the night-poaching act applies to it equally as to England. The Scotch day-trespass act (2 and 3 Will. IV. c. 68) closely agrees with the English act. But it is singular, that, in the case of night-poachers, the game cannot be taken from the poacher, even when caught in the act and on the lands; though it can be so in England.—Oke's *Game Laws*, by Bond, seventh edition, 1877, p. 360. The act conferring power on constables to stop and search poachers on the highway also extends to Scotland. In England the poaching of hares or rabbits by night in preserves is a misdemeanor; whereas it is only an offense punishable summarily in Scotland. In Ireland the law as to poaching is not identical with the law of England, there being distinct statutes, but substantially the law is the same.—*Paterson's Game-laws*, 182. The law of the United Kingdom has often been described as too severe against poachers, inasmuch as most of the penalties are cumulative, and the justices who administer the laws are generally game-preservers, and so inclined to convict on the smallest scintilla of evidence. But, on the other hand, it is answered that poaching is in reality only stealing under a milder name, and that the classes who poach are divided by a thin partition from thieves, game being, in every point of view, as much the fruit of the soil as apples or turnips, and the transition from habitual poaching to stealing being not only easy but inevitable. The objections above alluded to have been removed in Scotland by the Game Laws Amendment Act, 1877, 40 and 41, Vict. c. 28.

2. *Poaching fish* is the unlawfully entering on another's fishery in order to catch fish. The law of fisheries is not uniform in the United Kingdom. In England the general rule is that any one of the public may fish freely in the sea and in all navigable rivers; and where he can fish he can catch salmon as well as every other kind of fish. But there is an exception to this generality, which consists in this, that as the crown could before Magna Charta (which took away such right) legally grant a several or exclusive fishery in the sea or a navigable river to an individual, and as this was, in point of fact, often granted, it follows that it is not uncommon to find, even at the present day, an individual, generally the lord of an adjacent manor, still claiming a several fishery in these places. If he can prove that he has exercised this exclusive right as far back as one or two centuries, it will be inferred that his right dates from before Magna Charta, and therefore will be legal. When such is the case the public have no right to fish even in a navigable river or the sea at the specified places, the sole fishery being vested in this individual owner. In streams not navigable the rule is that each riparian owner—i.e., the owner of the lands on the bank of the stream—has a right to a several or exclusive fishery up to the middle line of the stream. If he is owner on both sides of the stream, then he has the exclusive fishery in the whole of the stream, so far as his lands extend. As to ponds, whoever is owner of the soil is the owner of a several fishery there, unless he has let it to another. As to lakes, it is not clearly ascertained how the fishery is to be divided between the owners of the lands abutting thereon; but much will depend on the title to the lands and the subsequent user. As a general rule, there is no such thing as a right in the public to fish anywhere, except in a tidal river or the sea, and that is subject to the exception of an individual claiming a several fishery, as before mentioned. It is often supposed that, at all events, if a highway adjoins a private stream, any one may fish in the stream or angle there; but this is a delusion. Nobody is entitled to use a highway for the collateral purpose of either fishing or poaching, the use of the highway, so far as the

public are concerned, being confined to the purposes of traveling or transport. The general rule as to all several—i.e., exclusive—fisheries is that whoever goes and poaches the fish commits an offense, for which he may be summoned before justices and fined £5, over and above the value of the fish taken; and if the fishery where he poaches is adjoining the dwelling-house of the owner of the fishery, it is a still higher offense, for it is then an indictable misdemeanor. It is immaterial what kind of fish is caught by poachers, whether salmon, or trout, or minnows; and it is immaterial how the fish are caught. But a milder punishment is awarded to the poaching angler, for even though he poach in a fishery adjoining the owner's dwelling-house, he incurs only a penalty of £5; and where the fishery does not adjoin a dwelling-house, he incurs a penalty of only £2. Whenever a fish-poacher is caught in the act of poaching, he may be at once apprehended, not only by the owner of the fishery, but by anybody; but this can only be done while he is on the spot or near it, for if he escape to the highway or to other lands before being arrested, he cannot then be apprehended, but can only be summoned before justices in the usual way. In this respect a privilege is given to anglers, for in no case can these be arrested if angling during the day-time; they can only be summoned for the offense. The poacher, when arrested, must be taken within a reasonable time before a justice of the peace, and charged with the offense. Though anybody may arrest the fish-poacher, still it does not follow that the fish poached can be taken from the poacher; on the contrary, the rule is the same as with reference to game, that whoever first catches the fish, whether legally or illegally, is entitled to keep it; and though game can on certain occasions be taken from the poacher, this is by reason of an express provision in the game act; but there is no similar provision as to poached fish, so that the poacher, whatever other punishment he may incur, does not lose his fish. With regard, however, to the poaching implements, such as nets, it is provided by an express section of the larceny act (24 and 25 Vict. c: 96, s. 25), that the owner of the fishery or land where the poacher is caught, or his servant, may demand, and if refused may seize, the net, rod, line, hook, or other implement used for taking the fish, but no other person can seize these. It may also be observed that the English salmon fishery act (24 and 25 Vict. c. 109), though singling out salmon from all other fish for peculiar protection, does not deal specially with poachers. Its chief object is to restrain the owners of salmon-fisheries themselves from fishing at certain times and by certain means, for which purpose a close season is declared, during which no person, whether otherwise entitled or not, can legally catch salmon. Of course, poachers are prohibited from catching salmon at the times and by the means forbidden to the owner, and in this sense come within the salmon acts. Thus, all persons are prohibited from poisoning salmon-rivers, from fishing salmon with lights, spears, gaffs, stroke, halls, or snatches; using fish-roe as a bait; selling or buying salmon-roe; using nets having meshes larger than 2 in.; from using fixed engines, fishing without a license, etc. See 24 and 25 Vict. c. 109, 28 and 29 Vict. c. 121, 36 and 37 Vict. c. 71. Bailiffs have power to arrest under Act 1878, 40 and 41 Vict. c. 39.

The law of Scotland, as to poachers of fish, differs considerably from that of England. In Scotland the fundamental rule is that salmon stands on a different footing from all other fish, and *primâ facie* belongs to the crown; so that no person in Scotland is entitled to fish salmon (even by angling) unless he can produce a grant or charter from the crown, conferring upon him such right. But, in point of fact, nearly all the great landed proprietors are in possession of such rights as pertinent to their lands. And the theory of the crown's original right to the salmon applies not merely to rivers, but to the sea-coasts all round Scotland. Hence the public have no right to fish with nets even in the sea, except by leave of the crown, or of the grantee of the crown at the spot in question. Where a salmon-river belongs to several proprietors, the rule is that none can fish by using fixed engines; but the only legal mode is the mode of fishing by net and coble (or boat). As regards poachers of salmon, the law is contained in the act 7 and 8 Vict. c. 95. By that law, whoever poaches salmon in a river, lake, or within a mile of the sea-shore, incurs a penalty of £5, besides forfeiting the boat, net, or other engine used to catch the fish. While the law is as above stated with respect to fishing salmon with nets, even a grant from the crown is required to enable a riparian owner to angle for salmon. Hence the right of angling for salmon is not a pertinent of the property in the banks, and each owner is not entitled to angle up to the middle of the stream. Anglers, although riparian owners, or who have a permission from such, are therefore all poachers, and incur a penalty. The Scotch salmon acts (25 and 26 Vict. c. 97, 27 and 28 Vict. c. 118, 31 and 32 Vict. c. 123) also forbid owners of fisheries and others fishing salmon by fixed engines, during close-time, etc. As regards other fish than salmon, the general rule is that the riparian owner is entitled to catch all the fish he can, provided he do not interfere with the superior right of some crown grantee of the salmon-fishery. A person who poaches trout or other fresh-water fish with a net, or by double-rod fishing, or cross-line fishing, or set-lines, etc., incurs a penalty of £5, besides forfeiture of the fish caught. And he may be arrested if he is net-fishing, but not if he is fishing in another way. Moreover, a mere angler of trout, though a poacher, cannot be arrested, nor yet punished by any penalty; though he is liable to an action at law, which, however, is virtually no remedy at all. So, in the case of all poachers of trout (except angling poachers, who can neither be arrested, nor yet have their fish or fishing-rod taken from them by force), the owner of the fishery, or any person authorized by him, may seize the nets, boats, and fishing

implements, if the poachers are found on the spot. Though angling for trout is thus privileged in Scotland (above what it is in England) in this respect, that the poaching angler cannot be arrested or fined by justices of the peace, but is only liable to an action, yet the poaching angler of salmon may be fined. The public have no right to angle from a highway adjoining a stream. Where a stream runs through a farm, the farmer has no right to angle for trout, unless the lease expressly allow it; but he cannot fish for salmon with a net, or even by angling, for it interferes with the crown grantee, if there is one. It has also been held that he cannot fish for trout with a net, but this decision is supposed to be doubtful, and would probably be qualified if the point were raised. There are special salmon statutes for the river Tweed and for the Solway, and the Scotch rivers running into these, and for some other rivers; but these statutes do not substantially differ from the general law. In Ireland the law of poachers of fish is the same as in England in all the main points, for the same statute applies. See Paterson's *Fishery Laws of the United Kingdom*, by Bund, second edition, 1878.

POCAHONTAS, the legendary "princess Pocahontas," b. about 1595, was the daughter of an Indian chief of Virginia. It is due to the vanity of Capt. John Smith, a bustling early settler, that this red Indian woman has been embalmed in his figmentary story as a heroine of romance, in that she died of love for the said John Smith years after she had prevented her father's braves from beating out his brains at the imminent risk of a similar visitation on her own; a fond imagination perpetuated in sculpture by Capellano, as may be seen any day over one of the doors of the capitol at Washington. But Mr. E. D. Neill, United States consul at Dublin, has recently dispelled the halo from the brow of this "blessed Pocahontas and great king's daughter of Virginia." According to evidence adduced by this gentleman, Pocahontas first appears in history tumbling wheels in the market-place of the English fort—a prototype of our city Arabs. Next she is living with a volunteer capt. called Cookham. Subsequently separate from him, she is betrayed by her uncle Patowomek (Potomak?) to Capt. Argall, the unscrupulous deputy-governor of Virginia, and held by him as a hostage for the purpose of extorting from her father such terms as he required. In pursuance of this plan John Rolfe, a married Englishman, marries her. Sir Thomas Dale, the governor, afterward brings the "Virginian princess" to England, as a means of extracting money from the government of James I. for the plantation. She created a sensation of curiosity in London and at court, and died at Gravesend in 1617, aged 21. The son she bore to John Rolfe returned to Virginia. Richard Randolph, son of an "esteemed and industrious mechanic," is said to have married Jane Bolling, the great-grand-daughter of Pocahontas, who is accordingly proudly referred to as an ancestress of the Randolphs and other distinguished families of Virginia. See *English Colonization of America*, by E. D. Neill (1871).

POCAHONTAS, a co. in n.w. central Iowa, drained by the west fork of the Des Moines and the Lizard river; traversed by the Illinois Central railroad; 576 sq. m.; pop. '90, 9553, chiefly of American birth. The surface is rolling. The soil is fertile. The principal productions are corn, wheat, oats, barley, and hay. Co. seat, Pocahontas.

POCAHONTAS, a co. in e. West Virginia, drained by the Gauley and Greenbrier rivers, intersected by the Alleghany mountains; about 765 sq. m.; pop. '90, 6814, with colored. The surface is uneven and heavily wooded, and the soil fertile. The principal productions are corn, wheat, and oats. Co. seat, Marlinton.

POCHARD, *Fuligula*, a genus of ducks, of the oceanic section (see Duck), having the bill as long or nearly as long as the head, broad and very flat, a little dilated toward the tip, the lamellæ of the upper mandible not projecting beyond the margin, the wings and tail short, the tail rounded. The windpipe of the male, in all the pochards, terminates in a labyrinth composed partly of bone and partly of membrane. There are numerous species, some of them natives of the arctic regions; some found, at least in winter, on the coasts of most parts of Europe, Asia, and North America; and some in the southern hemisphere.—The Common Pochard (*F.*—or *nyroca—ferina*), also known as the Dun Bird, and as the *red-headed poker* and *red-eyed poker*, is a frequent winter visitant of Britain. It breeds in very northern regions, and is abundant in all of them, but in winter migrates southward, in America as far as Carolina and Louisiana, whilst in Asia it has been found even in Bengal. It is smaller than the mallard, but rather larger than the widgeon. The head and neck are bright chestnut, the eyes red, characters which at once distinguish it from every other British duck. It is highly esteemed for the table. Great numbers are sold every winter in the London market.—Several other species are reckoned among British birds.—The Tufted Duck (*F. cristata*) is a frequent winter visitant of the bays, estuaries, and lakes of Britain. It is a plump and short bird; black, with a white bar on the wing; the breast, belly, and sides white. The occipital feathers are elongated.—The Canvas-back Duck (*F. valisneria*) of North America is a species of pochard. It is very like the common pochard, but is much larger, and has the bill higher at the base, and less dilated toward the tip. The upper parts are also whiter. The canvas-back duck breeds in the northern parts of America, and migrates southward in flocks in autumn. In winter, it abounds particularly on the Chesapeake and its tributaries, and is also common southward to New Orleans, often collecting in very large

flocks, particularly toward evening. It is very shy, but vast numbers are killed, it being in very high esteem for the excellence of its flesh.

POCO (Ital.), a little, a term much used in music, as *poco animato*, rather animated; *poco forte*, abbreviated *pf.*, rather loud; *poco a poco*, signifies by degrees, little by little; *poco a poco crescendo*, becoming loud by degrees; *poco a poco rallentando*, becoming slower by degrees.

POCOCK, EDWARD, D.D., 1604–91; b. Oxford, Eng., where he graduated, 1622, having devoted himself chiefly to the Hebrew, Arabic, Chaldee, and Syriac languages, prepared a Syriac version of the epistles of Jude, I. and II. Peter, and II. and III. John, in order to complete the New Testament in that language. These were printed at Leyden, 1629. Having taken orders in the English church he was appointed chaplain to the factory at Aleppo, 1630, where for six years he prosecuted the study of the oriental tongues, acquiring great proficiency in the Arabic, and increasing his knowledge of the Hebrew, Ethiopic, and Syriac; was chosen professor of Arabic at Oxford, 1636, and, having entered on his duties there, was sent to Constantinople to continue the study of Arabic, and to collect manuscripts; in 1640 returned home, and edited and translated into Arabic for circulation among Mohammedans the work of Grotius on the truth of the Christian religion, published 1660. The Arabic professorship had been endowed by archbishop Laud, but at his death the revenues he had set apart for that purpose were seized. Pocock then devoted himself to study in private; was presented by his college with the living of Childrey, 1643; by the exertions of his life-long friend, Selden, was reinstated in the Arabic chair, 1647; was made professor, also, of Hebrew, 1649; received from the king a rich canonry, which was confirmed to him by the parliament; but, as it was not the one originally annexed to his professorship, he refused to receive the revenue. From this canonry he was ejected, 1650; but was allowed to retain his professorships through the unanimous interposition of all the heads of houses, masters, and scholars at Oxford. In 1655 a plan to deprive him of his living was defeated through the influence of Dr. John Owen and other enlightened men, who strongly urged "the infinite contempt and reproach which would result from such treatment of a man whom all the learned, not of England only, but of all Europe, admired for his vast learning and accomplishments." All his attainments were devoted supremely to the work of biblical illustration. He contributed greatly to the completion of Walton's Polyglot; collated the Arabic Pentateuch; drew up an account of Arabic versions; contributed to the English Polyglot which appeared 1657; at the restoration he was restored, 1660, to the canonry of Christ church as originally annexed to the Hebrew professorship. In 1663 he published his translation of Abul-Faraj's compendium of the general history of the world from the creation to the end of the 13th c.; 1674, his Arabic translation of the church catechism and the English liturgy; 1677, his commentary on Micah and Malachi; 1685, on Hosea; 1691, on Joel. Of his learning, Hallam says that it was probably equal to that of any scholar whom Europe had produced. In person he was of middle height and slender; in conversation, free, affable, and facetious; in temper, modest, humble, and sincere; in beneficence, equaled by few.

POCOCKE, RICHARD, LL.D., 1704–65; b. Southampton, Eng.; graduated at Corpus Christi college, Oxford, 1731; traveled in the east in 1737–42; accompanied lord Chesterfield to Ireland as chaplain; was made archbishop of Dublin in 1745, bishop of Ossory in 1756, and transferred to the see of Meath in 1765. He published, in 1743–45, *A Description of the East and some other Countries*, with 179 drawings and maps, in 3 vols., and two years later the second volume of his travels, under the title of *Observations in Palestine, Syria, Mesopotamia, Cyprus, and Candia.* He was distinguished as a traveler for research, learning, and accuracy.

POCO CURANTE is an Italian phrase meaning one having little care or interest, and hence, the term has been used to designate a person of indifferent and careless disposition, a "devil-may-care."

POD. See LEGUME.

PODAGRA. See GOUT.

PODARGUS, a genus of birds of the family *caprimulgidæ*, nearly allied to the true goat-suckers (q.v.), but having no connecting membrane at the base of the toes, and the middle toe not pectinated. Some interesting species are natives of Australia, strictly nocturnal in their habits, and remarkable for the difficulty with which they are roused from their sleep by day. *P. humeralis* may be pushed off a branch, and seems scarcely to waken so as to save itself from falling to the ground; and if two are sitting together as is usually the case, one may be shot without its mate being much disturbed. But by night this bird is all activity.—Another species, *P. Cuvieri*, disturbs the night by a hoarse cry, resembling the syllables *more pork*, by which name it is therefore known in New South Wales.

PODESTÀ (Lat. *potestas*, power), an Italian municipal magistrate. The name was first applied to foreign magistrates with supreme authority, whom the emperor Frederick Barbarossa placed over the Italian towns on subjugating them. In the 13th and 14th centuries an officer bearing the same designation appears, at first occasionally, like the Roman dictator, afterward in most Italian cities as a permanent magistrate, appointed

either by the constituent parliament, or by the great council; he superseded all the ordinary magistrates, the military officers, and occasionally the judges. The cause of appointing such an officer was the jealousy that subsisted between the richer citizens and the nobles; the podestà was a stranger, generally belonging to the nobility, and prohibited, during his term of office, from forming any intimate connections in the city which he governed. His chief duty was the execution of summary justice on the lawless barons; and in the great Lombard towns he generally obtained a predominance for the citizens. Occasionally, however, the podestà became too strong for both parties, securing his re-election during a succession of years, and becoming the despotic ruler of the city.

Podestà is the name now given in many Italian towns to an inferior municipal judge.

PODGORITZA, a t. of Montenegro, in the district ceded to Montenegro by Turkey in terms of the treaty of Berlin. It is a fortified town, and has a population of about 7,500. Podgoritza is about 13 m. n. of Scutari.

PODICEPS. See GREBE.

PODIEBRAD AND KUNSTAT, GEORGE BOCZKO OF, son of Herant of Kunstat and Podiebrad, a powerful and influential Bohemian noble, of the Hussite party, was born in 1420. While still a youth he threw himself, with all the ardor and resolute force of his nature, into the Hussite struggles. Like the rest of his family, however, he adhered to the moderate party of the Hussites during the government of king Sigismund; but when, on the death of that monarch, the Catholic barons (1438) carried the election of Albrecht V. of Austria (II. of Germany), Podiebrad allied himself with the Utraquist orders in Tabor, and offered the sovereignty of Bohemia to Casimir, king of Poland. Albrecht immediately declared war against him, and invested Tabor, but was forced by Podiebrad to raise the siege and retire to Prague. From this time Podiebrad's influence was firmly established among the Utraquists; after Lipa, he was the first man of the party. When Albrecht died in 1439, Lipa was appointed regent during the minority of the new king Ladislas; but five years later Lipa himself died, and Podiebrad obtained the government of the country. He, however, was not satisfied. His ambition was to acquire the royal dignity. In 1449 he one night seized the capital, drove away all the Catholic barons, and even imprisoned his colleague in the regency, Meinhardt von Neuhaus. This outrage led to a year or so's fighting—the final result of which was that Podiebrad was acknowledged governor or regent by the whole of Bohemia. On the death of Ladislas in 1457, Podiebrad managed to get himself chosen his successor, and was crowned May 7, 1458. From this period he began to display the full power and strength of his administrative genius. He reorganized the forms of education and religion, and strove to bring about a peaceful settlement of the religious dissensions that had desolated the land. He even went the length of respectfully soliciting the papal co-operation in his humane endeavors; but his holiness would have no dealing with this Samaritan ruler, and in Dec., 1463, publicly proclaimed him a heretic. All the neighboring princes sent letters to Rome, exhorting or imploring the pope to moderation; but the only answer which Pius II. gave them was placing Podiebrad under the ban of the Vatican. Shortly after, Rudolf, the papal legate, excited the Catholics of Bohemia to insurrection. Podiebrad tried every means of conciliation, but in vain. In Sept., 1466, a German Catholic army burst into Bohemia, but this host of pseudo-crusaders was annihilated at Riesenberg. Once more Pius excommunicated Podiebrad; and in addition, he induced Mathias (q.v.) of Hungary to invade Moravia. The Bohemian king appealed to a universal council, but he also prepared to meet force with force Summoning back from abroad the banished Taborite warriors, he crushed the insurrection, and compelled his enemies to grant him an advantageous armistice. In 1467 his son Victorin, on the renewal of hostilities, invaded and devastated Austria, while the Hungarians who had invaded Bohemia were surrounded at Vilemov, and forced to cease from hostilities. In spite of the magnanimity shown by Podiebrad on this occasion, Mathias acted falsely toward him, and in the following year had himself crowned king of Bohemia and markgraf of Moravia. Podiebrad instantly summoned the Bohemian diet, and proposed to the assembled orders that they should take the king of Poland as his successor, while his own sons should merely retain the family possessions. By this means he obtained the Poles for allies; the emperor Friedrich also declared in his favor, while his Catholic subjects were reconciled to him, so that the Hungarians found it advisable to conclude a peace. Podiebrad died March 22, 1471. His sons, Victorin and Henry of Münsterberg, fell back into the ranks of the Bohemian aristocracy; but in the stormy days that followed they rendered good service to their native land.

PO'DIUM, a pedestal continued horizontally, so as to form a low wall on which columns may be set. Like the pedestal, it has a lease, die, and corona, all continued. When the podium breaks forward so as to form a pedestal for a column, it is called the stylobate.

PODOCAR'PUS, a genus of trees of the natural order *coniferæ*, suborder *taxineæ*, the order *taxaceæ* of some botanists. The leaves, like those of the allied Gingko tree, have a remarkable resemblance to the fronds of ferns. The species are natives of New Zealand, the South Sea islands, and the Indian Archipelago. Some of them are valuable

timber trees. *Podocarpus cupressina* is one of the best timber trees of Java. It is found also throughout the neighboring islands and the South Sea islands. It is a beautiful tree, 50 to 80 ft. high, with spreading pendulous branches; the wood is yellowish, and takes a very fine polish. *P. totarra*, the TOTARRA or TOTARRA PINE, is the most valuable timber tree of New Zealand. It grows in the southern parts of New Zealand, and its trunk has been known to attain a diameter of fully 12 ft. Its wood is equal to the best Baltic pine in durability and for ship-building. The wood of *P. elatus*, the GAGALI of the Fijians, is peculiarly elastic.

PODO'LIA, or KAMINETZ, a government of southwestern Russia, north of Bessarabia, and bordering on the Austrian frontier. Area, 16,224 sq. m.; pop. '90, 2,604,800. The surface is a table-land, strewn with hills, and containing many beautiful districts. Nearly three-fourths of Podolia is either arable or available for pasturage. Great quantities of corn and fruits, especially melons, are produced, and the fine climate is also favorable to the growth of the vine and mulberry. Hemp, flax, and tobacco are cultivated with success, and the rearing of bees is an important branch of industry. So rich and strong is the grass in the pastures or prairies, that the cattle, of which there are immense herds, can hide themselves from view in it. The population is composed of various races, who live together unmixed. The Russniaks (formerly "serfs"), make up the majority, and number over a million; next come the Cossacks; and then the Jews, who are almost all traders. The aristocracy are Poles; the officials and soldiery, Russians.

PODOPHTHAL'MA (Gr. stalk-eyed), a name often applied to a section or sub-class of crustaceans, part of the *malacostraca* of Cuvier, including the orders *decapoda* (crabs, lobsters, etc.) and *stomapoda* (shrimps, etc.). A distinguishing character, from which they derive their name, is their stalked and movable eyes. The stalks of the eyes are short in many, but very long in some, of which a beautiful example is presented by the sentinel crab of the Indian ocean.

PODOPHYL'LIN is the name commonly given to the resin obtained by means of rectified spirit from the root of *podophyllum peltatum*, or *May-apple*, a plant common throughout the United States. This resin, which occurs as a pale greenish amorphous powder, has (as well as the root from which it is derived) been introduced into the United States pharmacopœia, in consequence of the general favor which it has experienced during the last three or four years from the medical profession in this country. It is an active purgative, and seems to have the power of relieving the liver by exciting copious bilious discharges. As its activity seems to vary in different patients, it is better to begin with a small dose of half a grain, which may be combined with extract of henbane, with the view of preventing its griping. It is likely to prove one of the most valuable additions to our pharmacopœia.

PODOPHYL'LUM, a genus of plants variously ranked by botanists in the natural order *ranunculaceæ*, or made the type of a small distinct order, *podophylleæ*, or *podophyllaceæ*, differing from *ranunculaceæ* chiefly in having a solitary carpel. The genus podophyllum has 3 sepals, 6 to 9 petals, 12 to 18 stamens, a broad round stigma, seated almost on the top of the germen, and a many-seeded berry. *P. peltatum* is a perennial plant, with a solitary white flower in the axil of the two leaves; the fruit oval, an inch and a half long, smooth, yellowish, succulent, having a mawkish sweet and subacid taste. It is common in North America, growing in moist woods and on the shady banks of streams, and is known as MAY-APPLE, because it flowers and ripens its fruit very early in summer, also as *hog-apple* and *wild-lemon*. The fruit may be eaten, but is not agreeable. All the other parts are actively cathartic. See PODOPHYLLIN.

PODURA, a genus of small wingless insects of the order *thysanoura* (q.v.), having a linear or cylindrical body, a distinctly articulated thorax, rather long antennæ, and a long abdomen, terminating in a tail, which divides at its extremity into two branches. They bend the tail beneath the abdomen, and by suddenly extending it, make prodigious leaps. Hence their popular name, SPRING-TAIL. The species of this and allied genera are numerous, and some are found on plants, some under stones and in other damp places, some on the surface of stagnant waters. Their bodies are covered with scales, which are extremely interesting objects, and are among the favorite test-objects for the powers of microscopes.

POE, EDGAR ALLAN, perhaps the finest and most original poetical genius as yet produced by America, was b. at Boston, Feb. 19, 1809. His father, the son of Gen. Poe, a distinguished officer in the revolutionary army, was educated for the law, but, falling in love with a beautiful English actress, he married her and went himself upon the stage. In a few years the youthful couple died within a very short time of each other of consumption, leaving three children entirely unprovided for. Edgar, the second child, was adopted by Mr. John Allan, a rich merchant, who had no children of his own. In 1816 the boy went to England with Mr. and Mrs. Allan, and was sent to a school at Stoke Newington. In 1821 he returned to America, and attended an academy at Richmond, Va. In 1826 he entered the university of Charlottesville, where he was a very successful student, but quitted it at the end of a year, deeply involved in debt, chiefly incurred through his strong passion for gaming. For a year or two he now remained quietly at

home; the story of his having gone to assist the Greeks in their heroic efforts to throw off the yoke of their Turkish oppressors has no other foundation than the fact that his elder brother, who had gone to sea, got into some trouble with the police at St. Petersburg, from which he was rescued by the American minister. In 1827 Poe published a volume of poems, his first known essay in literature, under the title of *Tamerlane* and other poems. He now expressed a wish to enter the army, and Mr. Allan exercised his influence to secure him a cadetship in the military academy at West Point. Here he grossly neglected his duties, drank to excess, and was finally cashiered on Mar. 6, 1831. In the same year he published an enlarged collection of his poems, dedicated to the U. S. corps of cadets. Upon leaving West Point, Poe returned to Richmond, and was kindly received by Mr. Allan, who had become a widower and married a second wife. It is related that Poe's conduct to this lady was such that Mr. Allan had to eject him from his house, but there is some reason to hope that this is mere calumny. It is certain, however, that Mr. Allan had some strong reason for displeasure with Poe, and at his death in 1834 he left him unmentioned in his will. Thus thrown upon his own resources, Poe devoted himself to literature as a profession. In 1833 the publisher of a Baltimore magazine having offered prizes for the best prose story and the best poem, Poe competed, and won both prizes. This led to his friendship with Mr. John P. Kennedy, one of the prize committee, who procured him literary employment in connection with the *Southern Literary Messenger* at Richmond. While here Poe married his cousin, Virginia Clemm, a beautiful and saintly creature, as destitute as himself, who died in 1848. In 1837 he removed to New York, where he lived by contributing to the *New York Quarterly Review* and other periodicals, and where in 1838 he published *The Narrative of Arthur Gordon Pym.* In 1839 he became editor of *The Gentleman'sMagazine* at Philadelphia, and published a collection of his best stories with the title, *Tales of the Arabesque and Grotesque.* The next few years were spent in similar literary employment, chiefly at New York; the year 1845 being marked by the appearance of his famous poem *The Raven,* and 1848, by the publication of *Eureka, a Prose Poem,* in which he endeavored to elaborate a system of cosmogony.

In 1849 he went to Richmond, and it is said became engaged to a lady of considerable fortune. On Oct. 4 he left Richmond by train, which he quitted at Baltimore. Some hours later he was discovered insensible in the streets, and taken to the hospital, where he died on Oct. 7. The general belief that his death was caused by intoxication is emphatically denied by his physician, Dr. John J. Moran.

Scarcely any such dark and disastrous career as that of Poe has a place in all the sad records of genius. From the sins and aberrations of a creature so obviously abnormal, we need not seek to "point a moral." There is no doubt that Griswold in his life of Poe has been guilty of imputing to him a most exaggerated state of moral depravity. The assurance is given by those who best knew him, that the habits of at least his later life were temperate. There was about Poe a strange fascination; his friends loved him—those best who best knew him, and knew him in his wretchedest aberrations. By his wife and her mother he was regarded through all with an obstinacy of tender affection, not for an instant to be shaken.

Whatever may be thought of his morals, of his genius there will be little question. Slight in substance as for the most part it is, small in quantity, and in range limited, there is that in his poetry which ranks it above everything of this kind which his country had hitherto produced. Save for some traces of imitation in its earlier specimens, his verse is eminently a peculiar and individual product. In keen, clear, lyrical quality the music of Poe at his best is scarcely surpassed by that of any other poet. Many of his short prose tales are wildly and weirdly impressive, though too frequently indulging by morbid preference in ghastly and painful effects. Over very much that Poe has written, alike in prose and in verse, there broods a significant shadow of misery and hopeless portentous gloom. A much more favorable view than usual of Poe's character is taken by Mr. Ingram in the memoir accompanying his edition of Poe's works (4 vols., Edin., 1874); and Mr. Stoddard, in a memoir prefixed to a collection of his poems (New York and London, 1875), though not so favorable to his character as Ingram, shows him in a far better light than Griswold.

POE, Orlando Metcalf, b. Ohio, 1832; graduated at West Point with high honors in 1856, and entered the corps of topographical engineers. In 1861 he served for a time as chief engineer of the department of Ohio, and later was made col. of a Michigan regiment, and took part in the Potomac campaign. In 1862 he was made brig.-gen. of vols., and had charge of the engineer department in Sherman's army, remaining with him until Johnston's surrender. He was made brevet brig.-gen. for gallant conduct. He was for a number of years secretary and member of the U. S. board of light-house commissioners, and had charge of the construction of many important river and harbor works. He d. in 1895.

POERIO, Carlo, a noble Italian patriot, was b. Dec. 10, 1803. His father, Giuseppe P., baron Belcastro, was also highly distinguished for his love of liberty and for his sufferings in her cause. Born at Belcastro, in Calabria, in 1775, he took part in the Neapolitan revolution of 1799, and suffered imprisonment on its suppression, but was released in 1802. He also took part in the revolution of 1820, for which Ferdinand handed him

over to the Austrians, who assigned him as a place of abode, first Grätz, in Styria, and afterward Florence. On the recall of the exiles by Ferdinand, in 1833, Poerio returned to Naples, where he spent the rest of his life, and died Aug. 15, 1843. He left two sons, the elder, Alessandro [born in 1802, celebrated as a poet and patriot, and died (of amputation of a limb) after the battle of Mestre, Oct. 27, 1848], and Carlo, the subject of our notice. Carlo was educated with great care under the parental roof, and trained even from infancy, by the example of his father and brother, to place the love of his country above every other affection. In 1828 he joined the liberals of Naples, and took part in the conspiracy of Avellino, for which he was imprisoned until Mar., 1838. He was concerned in the attempt made in 1847 to extort liberty, but was discovered, and after the movement at Reggio was sent back to prison with D'Ayala, Bozzelli, De Augustinis, Assanti, and others. The revolution in Sicily, which broke out at Palermo on Jan. 12, 1848, set him at liberty, and he immediately gave himself to the organization of the famous demonstration of Jan. 27, 1848, which was destined to produce the constitution of Feb. 10. Carlo was successively nominated director of police, and minister of public instruction; but he soon resigned, and also refused the rank of privy councilor, offered to him by Ferdinand. He was appointed deputy to the parliament.

On July 18, 1849, an unknown hand left in Poerio's house a note to the following effect: "Flee without a moment's delay. You are betrayed. Your correspondence with the marquis Dragonetti is in the hands of the government." As there had been no such correspondence, and as it was Poerio's wish to maintain the combat to the last on the ground of legality, he did not flee. On the following day he was arrested, and his house was ransacked. Six days after a letter of Dragonetti's was given him to read, in which he spoke of an invasion by Garibaldi, instigated by Mazzini and Palmerston. The letter was a forgery of the police! Poerio compared it with other authentic letters of Dragonetti, and proved it to have been forged. As the government could not bring him to trial on that pretext, it had recourse to a spy, Jervolino, who accused Poerio of being at the head of a sect—which never existed—called the Italian unity, which aimed at proclaiming a republic, and murdering the king and the ministers. Poerio demanded to be confronted with Jervolino, but this was refused. When this accusation also fell to the ground, Peccheneda, who was at the head of the police, tried to induce the others who were indicted for political reasons to denounce Poerio as a revolutionist, promising them liberty as the reward. His design partly succeeded. He extorted from Romeo the printer, and from Margherita some false accusations, which the fear of death caused those unfortunate persons to make. But they were of no avail, and recourse was again had to the accusation made against Poerio by Jervolino; and although Poerio brought forward many clear proofs that the informer was paid by the police to do him harm, the court paid no attention to that, nor to any other of his objections, and concluded by inflicting on him the penalty of passing 24 years in irons, and of a heavy fine.

Thus Carlo Poerio, a minister, and a member of parliament, a man of rare genius and of exemplary life, was cast into the hulks at Nisida, dressed as a felon, and dragging 15 pounds of chains; and thence, through the suspicions of the government, who dreaded his escape, he was conveyed from hulks to hulks, from Nisida to Procida, from Ischia to Montefusco, and finally to Montesarchio. Assassins and thieves were given him as companions in order to humble him, as if the virtue of the truly great man could be sullied by the presence of miscreants and cut-throats. He indignantly spurned the proposal to petition for his liberty.

The protests of the English and French diplomatists against the iniquitous state trials, which had been instituted in Naples with the sole object of condemning persons obnoxious to the king; the letters of Mr. Gladstone; the constant dread of a popular rising on behalf of the condemned political offenders, and especially of Poerio, disturbed the mind of Ferdinand II. to such a degree that he sought some means of ridding himself of the prisoners of Montesarchio. Having failed in every attempt to force them to ask pardon, he resolved to send them to America. On Jan. 19, 1859, Poerio and 66 other prisoners, among whom were Settembrini, Spaventa, Pica, the duke of Castromediano, Braico, Schiavoni, Argentino, Pace, Damis (all of whom became members of the Italian parliament), were conveyed to Pozzuoli, and put on board of the *Stromboli*, which immediately set sail for New York. When they reached Cadiz, Poerio and his companions were put on board an American vessel, the captain of which, however, was induced to land them at Cork, whence they returned, by London, to Turin. In the following year Poerio was elected deputy by two colleges in Tuscany, and took his seat in parliament.

When Garibaldi (q.v.) had driven out the Bourbon dynasty, Poerio returned to Naples. He declined the ministerial office offered to him by Cavour, and also the governorship of the southern provinces proposed to him by Constantino Nigra, but accepted the office of privy councilor. The privy council elected him its vice-president; then, being re-elected deputy, he was proclaimed vice-president of the parliament. He died in April, 1867.

POET-LAUREATE. See LAUREATE.

POETRY (from the Greek *poieo*, to make, or to create), according to the mere etymology of the word, signifies a creation or production of any kind; but its classical equivalent, *poiēsis*, was applied by the Greeks almost exclusively to designate the artistic

productions of the imagination, expressed in language. Poetry is thus not necessarily associated—as many people seem to think—with verse or rhyme. It may find expression in prose, and in point of fact has often done so, both in ancient and modern times. The book of Ruth, for example, is decidedly poetical in substance, yet in form it is strictly prosaic. The same may be said in a still more remarkable degree of the book of Job and the prophetical writings, as they appear in our English version. Jeremy Taylor, Hooker, Rousseau, Burke, Carlyle, Ruskin, Hawthorne, Emerson, and other modern prose writers, are often as richly or profoundly imaginative as poets by profession; but although the essence of poetry lies rather in the nature and adornment of the thoughts expressed than in the form of the composition, yet in general it has subjected itself to certain rules of *meter* or measure, and often also to rules of *rhyme*. The reason of this practice lies in the fact that the music so produced by the mere words is found to heighten the emotions which their meaning is calculated to produce, and thus furthers the end that the poet has in view. It is from this circumstance that the term poetry has become almost synonymous with metrical composition. Poetical compositions are of several kinds or classes, to which particular terms are applicable; the principal are the epic (q.v.), the lyric (q.v.), and the drama (q.v.). To the first of these belongs the ballad (q.v.); to the second belong the song (q.v.) in all its varieties, serious and comic, the hymn (q.v.), ode (q.v.), anthem (q.v.), elegy (q.v.), sonnet (q.v.), etc.; the third embraces tragedy and comedy. Besides these three principal kinds others of less consequence may be mentioned, such as didactic poetry (q.v.), satirical poetry (see SATIRE), in which, however, imaginative and ideal elements in general mingle so sparingly that the stricter kind of critics exclude them from the circle of poetry altogether. The theory of poetry, or poetics (a branch of æsthetics, q.v.), has been largely discussed in every cultivated language. Histories of the poetry of the several nations are numerous: Rosenkranz and Zimmermann have given us universal histories of poetry.

POEY, FELIPE (1799–1891), b. Havana; educated at Madrid, which he was forced to leave on account of his connection with a political conspiracy. In 1837 he became a director of a natural history museum, which he had assisted in organizing, and soon afterward he was called to the chair of natural history in the university of Havana. He published, among other works, *La Centurie des Lépidoptères; Geografia Universal;* and *Memorias sobre la Historia Fisico-natural de la Isla de Cuba*. His son ANDRES, b. Havana, 1826, is a meteorologist, and has been director of the Havana physico-meteorological observatory. He is also known as an advocate of the positive philosophy of Comte. Among his works are *Electrical Storms*, 1855, *Catalogue of Earthquakes in the West Indies*, 1858; and *Chronological Table of* 400 *Cyclones, etc.*, 1862. In the *Report of the Smithsonian Institution* for 1870 he proposed a new classification of clouds.

POGGE, *Aspidophorus Europæus*, a fish of the family *sclerogenidæ*, or *mailed cheeks*, and nearly allied to the bullhead (q.v.), but having the body cuirassed with large bony scales from the head to the tail fin, so that it is in form nearly a pyramid with eight faces. The head is thicker than the body, with points and depressions, the snout furnished with short recurved spines. The pogge is also known on the coast of England as the *armed bullhead;* and on the coasts of Scotland by the names *lyrie, pluck,* and *noble*. It is pretty common on the British coasts. It is seldom more than six inches long. Notwithstanding its uncouth appearance, its flesh is good.

POGGENDORF, JOHANN CHRISTIAN, a German physicist, was born at Hamburg, Dec. 29, 1796. He studied pharmacy, chemistry, and physics; and was professor of physics at Berlin from 1834 till his death. In 1838 he became a member of the academy of sciences. His chief discoveries were in connection with electricity and galvanism, and these are reckoned of great value; he also invented a multiplying galvanometer for measuring the calorific action of currents. From 1824 onward he edited the *Annalen der Physik und Chimie*, contributing to this collection many important memoirs. He was one of the triad (Liebig and Wöhler being the other two) who prepared the *Dictionnaire de Chimie* (Brunswick, 1837–51). The two works published by himself are the *Linien zu einer Geschichte der exacten Wissenschaften* (Berlin, 1853), and *Biographisch-litterarisches Wörterbuch zur Geschichte der exacten Wissenschaften* (Leip. 1858–63, 2 vols.). Poggendorf died in Jan., 1877.

POGODIN, MIKHAIL PETROVITCH, b. Russia, 1800; professor at the Moscow university in 1830, but resigned in 1844 to pursue the study of archæology. His collection of Russian antiquities was bought by the government in 1852. He wrote novels, histories, and a tragedy. He founded in 1867 a literary and political periodical called the *Russki*. He was an advocate of Panslavism. He d. in 1875.

POGO'NIAS, a genus of acanthopterous fishes, of the family *sciænidæ*, having two dorsal fins, one of them deeply notched, and many small barbels under the mouth. The fishes of this genus are found on the coasts of warm countries; and are remarkable for sounds which they emit, which somewhat resemble those of a drum, and have obtained for them the name of DRUMFISH. It is not known how these sounds are produced; but sailors in vessels anchored near the shore, where species of this genus abound, are often prevented from sleeping, until they have become habituated to them. Some of the species attain a large size, one hundred pounds or more, and are excellent for the table.

POICTIERS, or POITIERS, a corruption of the Latin *Pictavium*, so called by the Gallic tribe, the *Pictavi*, who inhabited the district in Cæsar's time, is one of the oldest towns in France; it is the capital of the department of Vienne, and formerly of the province of Poitou. It occupies the summit and slopes of a little eminence, round the base of which flow the Clain and the Boivre, is encircled by walls and towers, and has a very dull appearance. Pop.'96, 38,518. It is connected by railway with Tours, from which it is 63 m. distant, and Bordeaux. Before the revolution, Poictiers had an immense number of churches, chapels, monasteries, and nunneries; even yet these are sufficiently numerous. The principal are the church of St. Jean (now converted into a *musée*), one of the oldest Christian monuments in France; and the cathedral of St. Pierre, one of the finest in France, belonging (in part) to the 12th c., and in which, or in the older edifice that occupied its site, 23 councils were held—the first in the 4th, and the last in the 15th century. It also contains the ashes of Richard Cœur de Lion. Its university, founded by Charles VII. in 1431, was also abolished after 1789, but its place has been supplied by a university-academy with two faculties. Poictiers possesses, besides, a very celebrated lyceum, and a variety of other educational institutions, a public library of 30,000 vols. and MSS., a museum and several learned societies, of which the most distinguished is that for the cultivation of the antiquities of western France. In and around Poictiers are numerous Celtic and Roman remains. In the vicinity, Alaric II., the Visigoth, was defeated and slain by Clovis in 507. Somewhere between Poictiers and Tours a great battle took place in 732, between the Franks under Charles Martel (q.v.) and the Moors under Abd-ur-Rahmân. The Moors were routed with enormous slaughter—375,000 of them (according to one old exaggerating chronicler) being left dead on the field; later still (in 1356), at Maupertuis-le-Beauvois, about 5 n. of Poictiers, Edward the Black Prince, with some 12,000 or 14,000 Englishmen and Gascons, beat 60,000 of the troops of king Jean of France, and took the monarch himself and one of his sons prisoners.

POIN'DEXTER, GEORGE, 1779–1853; b. Va.; of Huguenot ancestry, and left an orphan in early childhood. Having studied law at Richmond and practiced successfully in Virginia, he removed to Mississippi, 1802; was appointed attorney-general of the territory, 1803; was its delegate to congress, 1807–13; U. S. district judge, 1813–17; a representative of the state in congress, 1817–19; governor of the state, 1819–21; practiced law exclusively, 1821–31; U. S. senator, 1831–35. He was involved in many personal and political quarrels, one of which led to a duel, in which he killed his adversary, Abijah Hunt, a leading merchant of the southwest. In this affair he was accused of unfairness, and was consequently forced into bitter and protracted disputes. While in the house of representatives, 1819, he made a speech in defense of Gen. Jackson, which contributed greatly to the triumphant acquittal that followed. He did not vote with his party on the U. S. bank question, and brought on himself Jackson's bitter hostility by voting for the Clay resolution censuring the president. In 1835 he removed to Louisville, Ky., but returned soon after to Mississippi. He published a revised code of the laws of the state, 1824.

POINDING (same root as Eng. *pound*), in the law of Scotland, means the seizing and selling of a debtor's goods under process of law, or under the warrant of a *debitum fundi*, in order to pay the debt. It is either real or personal. Real poinding is the attaching of goods or movables on the land over which some real or heritable security exists. It is one mode in which heritable security is made effectual. Thus the superior of lands can poind the ground to obtain payment of his feu duties; and the holder of a heritable bond can do the same in order to recover his debt. Personal poinding is the mode in which a decree of the court is made effectual by the messenger or bailiff seizing the movables of the debtor. They are then appraised or valued, and the messenger reports his execution to the sheriff, or other judge ordinary, who grants warrant to sell the goods by public roup after advertisements. The net amount of the sale is paid over to the creditor, or if no purchaser bid for them, they are delivered to the creditor at the appraised value. There is also another kind of poinding, called a poinding of stray cattle, which takes place whenever the cattle of a stranger trespass on lands, in which case the owner or occupier of the lands can seize them *brevi manu*, and keep them as a security until the damage done by the cattle is paid to the owner of the land. By an old Scotch statute the owner of the cattle is bound to pay, besides the damage, half a merk for each head of cattle; and for the damage, penalty, and expense of keeping the cattle, the owner of the land can detain the cattle until payment. The poinder must, however, take care to keep the cattle in a proper place, and feed them. In England the word poinding is not used, the corresponding term being distraining, or distress (q.v.).

POIN'SETT, a co. in n.e. Arkansas, bounded on the e. by the St. Francis river, and lake St. Francis, drained also by L'Anguille and other rivers; about 720 sq.m.; pop. '90, 4272, inclu. colored. The surface is level, with much woodland. The soil is fertile. The principal productions are cotton and corn. Co. seat, Harrisburg.

POINSETT, JOEL ROBERTS, LL.D., 1779–1851; b. Charleston, S. C.; educated in Connecticut under president Dwight of Yale. He made a tour through Europe and Asia, studied medicine and military science, and on his return in 1809 was sent by President

Madison on a mission to South America to inquire into the condition of the Spanish provinces, then in revolt. He established commercial relations between the U. S. and Buenos Ayres, and went across the continent to Chile. There with the assistance of a band of Chileans he recaptured from the Spanish authorities of Peru 10 American whaleships which they had seized during an invasion of Chile. Returning to South Carolina he entered the state legislature, and was a member of congress, 1821–25. He went on a mission to Mexico in 1822, and was minister to that country, 1825–59. On his return he opposed nullification, and became the leader of the union party in South Carolina. He was secretary of war in Van Buren's cabinet. He afterward opposed the Mexican war. He founded an academy of fine arts at Charleston, and gave a museum to the Smithsonian institution.

POINT, in heraldry, a triangular figure issuing from the dexter and sinister base of the shield. It is common in French and German heraldry, and occurs in the shield of Hanover, which was a part of the royal arms of Great Britain from the accession of George I. till that of the present sovereign. A shield charged with a point is in heraldic drawing hardly distinguishable from one parted per cheveron.

POINT-BLANK. See GUNNERY. The point-blank range of a cannon varies from 200 to 300 yards.

POINT DE GALLE, a fortified t. and sea-port on the s.w. extremity of the island of Ceylon, stands on a low rocky promontory of the same name, in lat. 6° 1′ n., long. 80° 13′ east. The harbor, formed by a small bay, the entrance to which is about a mile in width, is good, although there are numerous rocks, and a pilot is required to conduct vessels to the anchorage. Among the principal edifices are the fort—a mile in circumference—the old Dutch church, a Roman Catholic chapel, an excellent orphan asylum, barracks, and light-house, 103 ft. above sea level. This town has become important within recent years, and specially since the organization of the Peninsular and Oriental steam-navigation company. Vessels plying between Suez and Bombay and Calcutta, Australia, China, Penang, and Singapore, call here to coal and to tranship passengers. It is the seat of government of the southern province of the colony of Ceylon. Gold and silver ornaments, workboxes, etc., are made with great taste and nicety by the native workmen. Pop. '91, 33,505.

POINTE-À-PITRE, a t. of the French West India island Guadeloupe, capital of the division of Grande-Terre, on the Little Cul-de-Sac, 20 m. n.e. of Basse-Terre. The town is well built, and has a safe and spacious harbor. It is the center of the commerce of the colony. Pop. 17,524.

POINTE COUPÉE, a parish in central Louisiana, bounded on the e. by the Mississippi, on the w. by Atchafalaya bayou; about 580 sq. m.; pop. '90, 19,613, includ. colored. The surface is even and low, frequently inundated, and well wooded. The soil is fertile. Corn, sugar, and cotton are the principal productions. Co. seat, New Roads.

POINTED ARCHITECTURE. See GOTHIC ARCHITECTURE.

POINTER, a kind of dog nearly allied to the true hounds (q.v.), but not reckoned one of them. It is remarkable for its habit of *pointing* at game; its whole body, and particularly its head, indicating the position of the game to the sportsman; and a well-trained pointer will remain long immovable in the attitude of pointing, not going forward to disturb the game which its exquisite power of scent has enabled it to discover. It is recorded of two pointers that they stood an hour and a quarter without moving, whilst Mr. Gilpin painted them in the act. The pointer, when he scents game, stops so suddenly and completely, that even the fore-foot, already lifted, remains suspended in the air. Without the pointer, the sportsman would have comparatively little success in the pursuit of grouse; but the dog performs for him the laborious task of "beating" the wide moors. Well-trained pointers will scarcely point at anything except "game;" but inferior dogs often point at almost any living creature the odor of which affects their nostrils. The habit of pointing, once acquired, appears to become hereditary, so that very young pointers often exhibit it in great perfection. It has been explained, with the crouching of the setter, as "the natural start of surprise or interest which all dogs give when coming suddenly upon the scent or sight of their natural prey; modified by cultivation, and by transmission through many generations, each, by education, improving upon the capabilities of the former."—See Bell's *British Quadrupeds*.

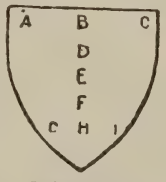
The breed of pointers now most common in Britain is believed to be crossed with the fox-hound, to which there is considerable resemblance in colors as well as in form. The figure is very muscular, the hair short, the ears pendulous, the upper lips moderately large, the tail pointed and destitute of brush. Dogs of this breed are very active, and capable of long-sustained exertion. The original breed, the *Spanish pointer*, probably brought to Spain from the e., is of more bulky form, less active habit, and less capability of continued exertion. The pointer is very forward and familiar in its manners, but is both affectionate and intelligent, although it has a reputation of inferiority in these respects to many other kinds of dogs.

POINT LEVI. See LÉVIS.

POINT PLEASANT, Battle of, Oct. 10, 1774, between colonial troops of Virginia under Gen. Andrew Lewis, and the Shuwanees, Delawares, and other Indians of the northern confederacy, led by Cornstalk as sachem of the Shuwanee tribe. Its field was on the e. bank of the Ohio river, just above its junction with the Great Kanawha. The village of Point Pleasant has since grown up on the spot where this battle was fought; and in the region the battle has always been spoken of as the first in the revolution. Lord Dunmore, governor of Virginia, had been busy in the interests of England, in stirring up a hostile feeling between the white settlers and the various tribes of Indians, the object of which had become apparent. At last a crisis was reached. The legislature took action, under which Gen. Andrew Lewis gathered together 1200 men at Lewis Spring, now Lewisburg, W. Va., and proceeded to Point Pleasant, acting, as was understood, in concert with the colonial governor, who, in person, led about 1000 men through the wilderness, striking the Ohio at Wheeling, from which point he was to meet Gen. Lewis. All this time, unknown to Gen. Lewis, the agents of lord Dunmore had been busy concentrating the Indians in the neighborhood of Point Pleasant, and subsequent events indicate that he never intended to join his force with the troops under Lewis.

In this bloody battle about one-fifth of the entire army of Gen. Lewis were either killed or wounded, and of the Indians the number must have been even greater. It was fought, on both sides, from behind trees, in a dense forest of primeval growth on one of the richest bottoms of the Ohio. It was wholly unexpected—the object being, on the part of Gen. Lewis, in fulfillment of the purposes of the legislature, to proceed with an overpowering force in conjunction with Governor Dunmore from Point Pleasant, to the Indian settlements on the Scioto beyond the Ohio. In vain did the brave Lewis look for the troops from Wheeling. During the night of the 9th and 10th, a body of Indians was reported by a scouting party as having encamped near the site of an old Shuwanee village about 6 m. above. At the same time advices were received that lord Dunmore would cross the country direct to the Scioto. Before sunrise on the morning of the 10th a hunting party returned and brought the startling report of a large body of Indians about a mile above the camp of Gen. Lewis. The party had been fired upon. At once, on receipt of this news, the main body of the troops, under Col. Charles Lewis and Col. Fleming, were mustered into line. The battle, which soon began, raged with varied fortune through nearly the entire day. The brave Col. Lewis fell mortally wounded. Col. Fleming was soon after disabled, when Col. Field, who had come up with a re-enforcement, took command. This officer had learned a lesson under the unfortunate Braddock; but he, too, soon fell. At times the battle raged like a tempest. The roar of musketry was continuous. The clarion voice of Cornstalk was nevertheless everywhere heard bidding his warriors "Be strong!" "Be strong!" Seeing a warrior shrink he sunk his tomahawk into his skull. Late in the afternoon three companies under capts. John Stewart, Isaac Shelby, and George Matthews, that had been detained in camp, perhaps on account of Indians in large numbers on the opposite shore of the Ohio, reached the rear of Cornstalk by a well-planned movement, and decided the fortunes of the day.

POINTS of the **ESCUTCHEON,** in heraldry. In order to facilitate the description of a coat-of-arms, it is the practice to suppose the shield to be divided into nine points, which are known by the following names: A, the dexter chief point; B, the middle chief; C, the sinister chief; D, the collar or honor point; E, the fess point; F, the nombril, or navel point; G, the dexter base point; H, the middle base point; and I, the sinister base point. The dexter and sinister sides of the shield are so called, not in relation to the eye of the spectator, but from the right and left sides of the supposed bearer of the shield.



Points of the Escutcheon.

POISONING, Secret, a mode of taking away life by poisons so slow in their operation that the gradual sinking of the victims under their influence closely resembled the effects of disease or the ordinary decay of nature. It has been practiced in all ages, and several undoubted and numerous supposed instances of it are mentioned by Greek and Roman writers. It was not, however, till the 17th c. that this atrocious practice became of frequent occurrence; but from this time it rapidly increased, spread over western Europe like an epidemic, and became gradually a regular branch of education among those who professed a knowledge of chemistry, magic, or astrology. These persons regarded the knowledge of the mode of preparing secret poisons as of the highest importance, and many of them realized large sums by the sale of their preparations, and occasionally of the secret of their composition. It was in Italy and France that this art was chiefly practiced and brought to the highest perfection; but it seems also to have prevailed in England to a considerable extent, for we find that in the 21st year of Henry VIII.'s reign an act was passed declaring the employment of secret poisons to be high treason, and sentencing those who were found guilty of it to be boiled to death. The only undoubted instance of this crime which appears prominently in English history is the murder of sir Thomas Overbury (q.v.) by viscount Rochester (the favorite minion of James VI.) and his wife, the divorced countess of Essex; though many suppose, and with some show of proba-

bility, that James I. himself was a victim to similar nefarious practices on the part of Villiers, duke of Buckingham; and undoubtedly such was the popular impression at the time, for Dr. Lamb, a conjurer and quack, who was believed to have furnished Buckingham with the poisons, was seized by the angry populace in Wood street, Cheapside, London, and beaten and stoned to death. But it was in Italy where this mode of poisoning was most prevalent. There, judging from the writings of various authors, it seems to have been looked upon as a not unjustifiable proceeding to get rid of a rival or enemy by poison; and from the time of the Lombard invasion down to the 17th c. Italian history teems with instances which sufficiently show that poison was both the favorite weapon of the oppressor, and the protection or revenge of the oppressed. The Borgias are generally singled out and held up to the horror and detestation of mankind; but as far as their poisonings are concerned, they merely employed this method of destroying their adversaries a little more frequently than their neighbors. To show the popular feeling on this subject, we may instance the case mentioned in the memoirs of Henry II., fifth duke of Guise, of a soldier who was requested to rid the duke of Gennaro Annese, one of his opponents in Naples. *Assassination* was the mode proposed to the soldier, but he shrank with horror from the suggestion, stating at the same time that he was quite willing to *poison* Annese. It was shortly after the date of this story (1648) that secret poisoning became so frequent; and the Catholic clergy, despite the rules of the confessional, felt themselves bound to acquaint pope Alexander VII. with the extent of the practice. On investigation it was found that young widows were extraordinarily abundant in Rome, and that most of the unhappy marriages were speedily dissolved by the sickness and death of the husband; and further inquiries resulted in the discovery of a secret society of young matrons, which met at the house of an old hag, by name Hieronyma Spara, a reputed witch and fortune-teller, who supplied those of them who wished to resent the infidelities of their husbands, with a slow poison, clear, tasteless, and limpid, and of strength sufficient to destroy life in the course of a day, week, month, or number of months, as the purchaser preferred. The ladies of Rome had been long acquainted with the "wonderful elixir" compounded by La Spara; but they kept the secret so well, and made such effectual use of their knowledge, that it was only after several years, during which a large number of unsuspected victims had perished, and even then through a cunning artifice of the police, that the whole proceedings were brought to light. La Spara and thirteen of her companions were hanged, a large number of the culprits were whipped half-naked through the streets of Rome, and some of the highest rank suffered fines and banishment. About half a century afterward the discovery was made of a similar organization at Naples, headed by an old woman of three-score and ten, named Toffania, who manufactured a poison similar to that of La Spara, and sold it extensively in Naples under the name of *acquetta*, and even sent it to all parts of Italy under the name of "manna of St. Nicola of Bari," giving it the same name as the renowned miraculous oil of St. Nicola, to elude discovery. This poison, now best known as the "acqua Tofana" or "acqua di Perugia," is said by Hahnemann to have been compounded of arsenical neutral salts; while Garelli states that it was crystallized arsenic dissolved in a large quantity of water; but both agree that it produced its effect almost imperceptibly, by gradually weakening the appetite and respiratory organs. After having directly or indirectly caused the death of more than 600 persons, Toffania was at length seized, tried, and strangled in 1719. From this time the mania for secret poisoning gradually died away in Italy.

About the middle of the 17 c, this horrible practice seems to have first become prevalent in France, and under similar circumstances, the agents being married women, and their husbands the victims; and as in Italy, the extent to which the practice was carried was first made known by the clergy. The government, acting on the information thus obtained, seized and imprisoned in the Bastille two Italians named Exili and Glaser, who were suspected of having been the manufacturers and venders of the poisons. Glaser died in prison: but Exili, becoming acquainted with another prisoner named St Croix, communicated to him his secret, which the latter made considerable use of after his release, compounding in particular the poison known as "succession powder," which subsequently became so celebrated. It was the same St. Croix who played such a prominent part in the tragical history of the marquise de Brinvilliers (q.v.). Penautier, the treasurer of the province of Languedoc, and the cardinal de Bonzy, were both pupils of St. Croix, and managed, the one to pave the way for his own advancement, and the other to rid himself of his numerous creditors, by the administration of poison; but the great influence of these men, and the want of direct evidence, barred all proceedings against them. Secret poisoning now became fashionable; the passions of jealousy, revenge, avarice, and even petty spite, were all satisfied in the same way, and as a necessary consequence, other offenses decreased in proportion. The prisons teemed with suspected criminals, and the "chambre ardente" was instituted for the special purpose of trying these offenders. In Paris, this trade was chiefly in the hands of two women named Lavoisin and Lavigoreux, who combined with the ostensible occupation of midwife that of fortune-teller, and foretold to wives the decease of their husbands, to needy heirs that of their rich relatives, taking care at the same time to be instrumental in fulfilling their own predictions. Their houses were frequented by numbers of all classes, both from Paris and the provinces, among whom were the celebrated marshal de Lux-

embourg (q.v.), the duchesse de Bouillon, and the comtesse de Soissons ; the two former of these, however, went merely from curiosity. Lavoisin and her confederate were at last discovered, tried, condemned, and burned alive in the Place de Grève, Feb. 22, 1680; and from 30 to 50 of their accomplices were hanged in various cities of France. So common had this atrocious practice been, that madame de Sévigné, in one of her letters, expresses a fear lest the terms "Frenchman" and "poisoner" should become synonymous. For two years after the execution of the two Parisian poisoners, the crime continued to be largely committed, being fostered by the impunity with which offenders of of high rank were allowed to escape; and it was not till more than 100 persons had died at the stake or on the gallows, that the government succeeded in suppressing it. The mania for secret poisoning has not since been revived to the same extent, though isolated instances of its practice have occasionally been discovered, particularly in England, where, within the last 40 years, very extraordinary disclosures have at different times been made of the prevalence of this frightful crime among the laboring classes in several of the rural districts. For further information consult Beckmann's *History of Inventions*, the historians of the period of James I.'s reign, the French *Causes Celebres*, and Mackay's *Popular Delusions*.

POISONS. A poison is commonly defined to be a substance which, when administered in small quantity, is capable of acting deleteriously on the body; but this definition is obviously too restricted, for it would exclude numerous substances which are only poisonous when administered in large doses, as niter, and the salts of lead, antimony, etc. A person may be as effectually poisoned by an ounce of niter as by five grains of arsenic, and hence the quantity required to kill must not enter into the definition. Dr. Taylor suggests the following as the most comprehensive definition that can be given: "A poison is a substance which, when taken internally, is capable of destroying life without acting medicinally on the system;" but this definition is not perfect, for it does not include poisons that act by absorption when applied to a thin and delicate membrane, as glanders, syphilitic poison, etc., or those which must be introduced directly into the circulation by a puncture or abraded surface, as the poison of insects, scorpions, and serpents, the wourali poison, and that of animals suffering from hydrophobia. Omitting, for the present, the consideration of the cases not included in Dr. Taylor's proposed definition, we may consider poisons as divisible into three classes, according to their mode of action on the system—viz., *irritants*, *narcotics* and *narcotico-irritants*.

The *irritants*, when taken in ordinary doses, speedily occasion intense vomiting and purging, and severe abdominal pain. They act chiefly on the stomach and intestines, which they irritate, inflame, and frequently corrode, and may thus occasion ulceration, perforation, or gangrene. Among those which possess corrosive properties, are the strong mineral acids, caustic alkalies, corrosive sublimate, etc.; while among the pure irritants which exert no destructive chemical action on the tissues with which they come in contact, may be mentioned arsenic, cantharides, carbonate of lead, etc. The *narcotics* act specially on the brain and spinal cord. Among their most common symptoms are giddiness, headache, obscurity of sight or double vision, stupor, loss of power of the voluntary muscles, convulsions, and, finally, complete coma. Moreover, many of the narcotic poisons present special symptoms, in some cases strongly resembling pure special diseases. Thus there is an almost exact similarity in the symptoms of poisoning by opium and of apoplexy, while prussic acid and some other poisons give rise to symptoms closely resembling those of epilepsy. These poisons have no acrid, burning taste, nor do they usually give rise to vomiting or diarrhea, and, excepting a slight fullness of the cerebral vessels, they leave no well-marked *post mortem* appearance. They are few in number, and none of them belong to the mineral kingdom. The *narcotico-irritants* have, as their name implies, a mixed action. "At variable periods," says Dr. Taylor, "after they have been swallowed, they give rise to vomiting and purging, like irritants, and soon or later produce stupor, coma, paralysis, and convulsions, owing to their effect on the brain and spinal marrow. They possess the property, like irritants, of irritating and inflaming the alimentary canal. As familiar examples, we may point to nux vomica, monkshood, and poisonous mushrooms. . . . . The fact of the symptoms occurring after a meal at which some suspicious vegetables may have been eaten, coupled with the nature of the symptoms themselves, will commonly indicate the class to which the poison belongs. Some narcotico-irritants have a hot, acrid taste, such as the aconite or monkshood; others an intensely bitter taste, as nux vomica and its alkaloid strychnia."

For a notice of the most important rules to be observed by the physician in all cases of suspected poisioning, both with respect to the symptoms and to the inspection of the body, we must refer to any of the standard works on poisoning, or on medical jurisprudence.

Under the head of *irritant poisons* may be included, (1) mineral acids, as sulphuric, nitric, and hydrochloric acids; vegetable acids, and other salts, as oxalic acid, binoxalate of potash, and tartaric acid (in doses of half an ounce or more); the alkalies, as pearl-ash (carbonate of potash), soap lyes (carbonate of soda), ammonia and its sesquicarbonate; and metallic compounds, as white arsenic (arsenious acid); yellow arsenic (orpiment), corrosive sublimate, bicyanide of mercury, pernitrate and other salts of this metal, acetate of lead (sugar of lead) in doses of an ounce and upward, carbonate of

lead (white lead), sulphate of copper (blue vitriol) subacetate of copper (verdigris), arsenite of copper (commonly known as *Scheele's green* or *emerald green*, and much employed under the name of *extract of spinach* for coloring confectionary), tartarized antimony, chloride of antimony (butter of antimony), chloride of zinc (sir W. Burnett's fluid), nitrate of silver (lunar caustic), sulphate of iron (copperas and green vitriol), and bichromate of potash. (2.) Vegetable substances, viz., colocynth and gamboge in large doses, savin, croton oil, the leaves and flowers of the common elder (*Sambucus nigra*), etc. (3.) Animal substances, such as cantharides, to which must be added the occasional cases in which sausages, and certain fish and mollusks, usually quite innocuous, act as irritant poisons.

The *narcotic poisons* include opium, hydrocyanic (or prussic) acid, oil of bitter almonds, cyanide of potassium, henbane, especially the seeds, alcohol, ether, chloral, and chloroform; while *narcotico-irritant poisons* are nux vomica, meadow saffron (*colchicum*), white hellebore, foxglove, common hemlock, water hemlock, (*cicuta virosa*), hemlock water-dropwort (*œnanthe crocata*), fool's parsley, thorn-apple, monkshood or wolf's bane, deadly nightshade, tobacco, Indian tobacco (*lobelia inflata*), the bark and seeds of the common laburnum, the berries and leaves of the yew-tree, and certain kinds of fungi.

The cases in which there are antidotes qualified to neutralize chemically the action of the poison are few in number. For the *mineral acids* we must prescribe chalk or magnesia in water, with the view of neutralizing them, after which milk should be given freely. The *alkalies and their carbonates* must be neutralized by vinegar and water, or lemon-juice mixed with water, after which milk should be given. For *oxalic acid* the antidote is chalk or magnesia in water, by which an insoluble oxalate of lime or magnesia is formed. For *arsenic*, the hydrated peroxide of iron has been regarded as an antidote, but its efficacy is doubtful. Vomiting should be excited by the administration of a scruple of sulphate of zinc in warm water, and after the stomach has been well cleared out, demulcent fluids, such as flour and water or milk should be given. *Corrosive sublimate* combines with albumen (white of egg), and forms an insoluble inert mass; *nitrate of silver* is neutralized by chloride of sodium (common salt) dissolved in water; *tartarized antimony* is to a great degree rendered inert by the administration of decoction of bark or gall-nuts; and *acetate of lead* is rendered inert by the administration of sulphate of magnesia, which converts it into an insoluble sulphate of lead. In all cases of suspected poisoning, in which the nature of the poison is not known, the safest course is at once to produce vomiting by sulphate of zinc, or in its absence by a dessert-spoonful of flour of mustard suspended in tepid water, and to continue the vomiting till all the contents of the stomach are discharged, after which milk should be given freely.

Most of the known gases—except hydrogen, nitrogen, and oxygen—have a poisonous action when inhaled into the lungs; but in these cases death, if it ensues, is popularly said to be due to *suffocation*, although strictly speaking a person who dies from the effect of carbonic acid, or sulphureted hydrogen, or of any other noxious gas, is in reality just as much poisoned as if he had taken oxalic acid or arsenic. *Carbonic acid* (q.v.), although seldom employed as an instrument of murder, is a frequent cause of accidental death, and in France is a common means of self-destruction. It is established by numerous experiments that air containing more than *one-tenth* of its volume of carbonic acid, will, if inhaled, destroy life in man and the higher animals. In its pure state it cannot be inhaled, because its contact with the larynx causes spasmodic contraction of the glottis; but when diluted with two or more volumes of air, it can be breathed, and produces symptoms of vertigo and somnolency; and so great a loss of muscular power, that the individual, if in an erect or sitting position, falls as if struck to the ground. The respiration, which at first is difficult and stertorous, becomes suspended. The action of the heart is at first violent, but soon ceases, sensibility is lost, and the person now falls into a comatose or death-like state. Those who have been resuscitated usually feel pain in the head and general soreness of the body for some days and in a few severe cases, paralysis of the muscles of the face has remained. As a winter seldom passes without several deaths being recorded from coal or charcoal being employed as fuel in ill-ventilated rooms (often without any kind of chimney), it is expedient that every one should know what is to be done in such an emergency. The patient must, of course, be at once removed from the poisonous atmosphere, after which artificial respiration should be had recourse to. If the skin is warm, cold water may be poured on the head and spine; while if the surface be cold, a warm bath should be employed. When respiration is re-established, venesection will often relieve the congestion of the vessels of the brain. The inhalation of oxygen gas is said to have been of service in these cases. *Carbonic oxide*, which exists largely in coal gas, is at least as active a poison as carbonic acid, and is doubtless the principal cause of the effects produced by the inhalation of diluted gas. Both carbonic acid and carbonic oxide act as powerful narcotic poisons. *Sulphureted hydrogen*, which occurs abundantly in foul drains, sewers, cess-pools, etc., is a gaseous poison whose effects are often noticed. Nothing certain is known of the smallest proportion of this gas required to destroy human life; but air containing only one eight-hundredth of its volume of this gas will destroy a dog; and when the gas exists in the proportion of one two-hundred-and-fiftieth, it will kill a horse. Dr. Taylor states that the men who were engaged in the construction of the Thames

tunnel suffered severely from the presence of this gas, which was probably derived from the action of the water on the iron pyrites in clay, and which issued in sudden bursts from the walls. By respiring this atmosphere, the strongest and most robust men were in the course of a few months reduced to an extreme state of exhaustion, and several died. The symptoms with which they were first effected were giddiness, sickness, and general debility; they became emaciated, and fell into a state of low fever accompanied by delirium. In this case the dilution was extreme; when the gas is breathed in a more concentrated form, the person speedily falls, apparently lifeless. It appears to act as a narcotic poison when concentrated; but like a narcotico-irritant when much diluted with air.

The action of the vapor of *hydrosulphate of ammonia*, which is also commonly present in cesspools, etc., is probably much the same as that of sulphureted hydrogen. The experiments of Dr. Herbert Barker show, however, that these matters do not produce similar symptoms on dogs (*On Malaria and Miasmata*, p. 212).

Many of the gases, which are only found as products of the laboratory, are in the highest degree poisonous, as arseniureted hydrogen, cacodyl, etc.; but as few persons run the risk of inspiring them, it is unnecessary to enter into any details regarding them.

We now turn to the consideration of the poisons not included in the definition, which, for want of a better, we have adopted. The poisons that may affect the body by direct introduction into the circulation, through a puncture or abrasion, may be derived from the mineral, the vegetable, or the animal kingdom; but, with a few exceptions (as, for example, wourali poison), the poisons derived from the mineral and vegetable kingdoms would act as efficiently if introduced into the stomach as if injected into the circulating blood; while the animal poisons act only by direct introduction into the blood, and are inert when introduced into the stomach. Poisoned wounds derived from the dissection of recently dead bodies, commonly known as *dissecting wounds*, are occasionally attended with most alarming symptoms, and often terminate fatally. In the case of Dr. Pett, quoted by Travers in his work *On Constitutional Irritation*, the symptoms on the third day were "a haggard and depressed countenance; violent shiverings, followed by some degree of heat; extreme alteration in appearance; countenance suffused with redness; the eyes hollow and ferrety; some difficulty of breathing, which was sudden, irregular, and amounting almost to sighing; excessive torpor, and the whole aspect resembling one who had taken an overdose of opium; on the following day there was extreme exhaustion and feebleness, and death ensued on the fifth day." The symptoms produced by the bites and stings of insects, arachnidans, and serpents, and the treatment that should be adopted, are described in the article Venomous Bites and Stings. The poisoned wounds derived from diseased animals are sufficiently discussed in the articles Glanders and Hydrophobia.

In point of law, the use of poison to kill or injure a human being or certain animals, renders the poisoner amenable to the criminal courts. With regard to the sale of poisons, the English law found it necessary to put some restrictions on one description—viz., arsenic—in order to prevent persons obtaining it with facility, and in such a manner as to avoid detection. The 14 and 15 Vic. c. 13, requires every person who sells arsenic to enter in his books the date and quantity and purpose of its use, and later acts apply this rule to other poisons. It is not to be sold to one who is unknown to the vender unless in presence of a witness who is known, and whose place of abode is recorded in the book. The arsenic must also be mixed with soot or indigo, in the proportion of ½ oz. of soot or indigo to the pound. All the boxes, bottles, etc., must be labeled "poison." Those who offend as to arsenic incur a penalty of £20; but, in ordinary prescriptions, poisons may be used in the ordinary way by duly qualified medical practitioners. As to the restriction on the sale of other poisons, see Chemist. The offenses committed by those who administer poisons to mankind are as follows: Whoever causes death by poison commits murder, for the means are immaterial if the death was caused by such means with a felonious intent. Where death is not caused, nevertheless whoever administers poison, or causes it to be administered to any person, with intent to commit murder is guilty of felony, and is liable to penal servitude for life, or for not less than 3 years. Moreover, whoever attempts to administer poison, or other destructive thing, to any person with intent to commit murder, is guilty of felony, and is punishable in the same way. These offenses are committed whether the poison administered, or attempted to be administered, does injury or not; and it is a sufficient committing of the offense if the poison is put in such a place that a party was likely, and was intended to take it. Moreover, even though murder was not intended, but merely an intent to endanger life or inflict grievous bodily harm, still the offense is felony, and is punishable by penal servitude varying from 3 to 10 years. There is also a similar punishment for the attempt to administer any stupefying drug. Not only is it a crime to administer, or attempt to administer poison to human beings, but if cattle are maliciously killed by poison, the offense is felony, punishable by penal servitude of from 3 to 14 years. So to kill by poison any dog, bird, beast, or other animal, ordinarily kept in a state of confinement, is an offense punishable by justices of the peace with imprisonment for 6 months, or a fine of £20 over and above the injury done. If any person lay poison on lands to kill game, he incurs a penalty of £10. And though tenants of farms, when entitled to kill the

game on the estate, may kill hares without having taken out any game certificate, yet they are prohibited from killing such hares by poison. Moreover, by a recent act, 26 and 27 Vic. c. 113, extending to the United Kingdom, whoever sells, or offers to sell poisoned grain, seed, or meal, incurs a penalty of £10. Whoever sows, lays, or puts on ground such poisoned grain incurs a like penalty. The use of poisoned flesh is also prohibited. But the sale or use of any solution, material, or ingredient for dressing, protecting, or preparing any grain or seed for agricultural use only, if used *boná fide*, is not interfered with. See PTOMAINES.

POISON UDER, POISON IVY, POISON OAKS, POISON SUMACH, and POISON VINE. See SUMACH.

POISSON, SIMÉON DENIS, a celebrated French geometer, was b. at Pithiviers, in the dep. of Loiret, June 21, 1781; and displaying an aptitude for mathematics, he was received into the école polytechnique in 1798. The striking talent he thus early exhibited attracted the notice of Lagrange and Laplace, both of whom anticipated for him a brilliant future. In 1802 he became a professor in the polytechnique; in 1808 a member of the bureau des longitudes; in 1809 professor of mechanics to the faculty of sciences; member of the institute in 1812, etc.; and this list of distinctions was crowned in 1837 by his elevation to the dignity of a peer of France. He died in 1840. Poisson's whole life was devoted to the prosecution of scientific research, and the fruits of his pen number about 300 memoirs, inserted in the publications of the école polytechnique, of the academy of sciences, and other scientific journals. A complete summary of these labors by Poisson himself is published by Arago (*Notices Biographiques*, vol. ii.). Of the separate treatises published by Poisson, the following are the chief: *Traité de Mécanique* (2 vols., 1833); *Nouvelle Théorie de l'Action Capillaire; Théorie Mathématique de la Chaleur* (1835); *Mémoire sur le Mouvement des Projectiles dans l'Air, en ayant égard à la Rotation de la Terre* (1839); and lastly, the celebrated work, *Sur l'Invariabilité des Moyens Mouvements des grands Axes Planétaires.* Poisson is fairly considered one of the chief founders of the science of mathematical physics, which was brought by him to great perfection, especially in what concerns statical electricity and magnetism. Many other ingenious discoveries and speculations are dispersed throughout his writings.

POITEVIN, AUGUSTE, 1819–73; b. France; studied sculpture at Paris. His first work of value was "The Devotion of Viola," exhibited in 1846. Among his other works are two statues called "The Renaissance" and "Greek Art," executed for the Amiens museum. A number of symbolical groups in the Louvre, some fine busts, and the group called "Judith."

POITIERS. See POICTIERS.

POITOU, a former province of w. France, is now mainly comprised in the departments of Deux Sèvres, Vendée, and Vienne. It was divided into Upper and Lower Poitou, and had for its capital Poictiers (q.v.). Poitou first became a possession of the English crown when Eleanor, countess of Poitou and duchess of Aquitaine, after her divorce from Louis VII. of France in Sept. 1151, married, on Whitsunday following, Henry of Anjou, afterward Henry I. of England. Philippe-Auguste reconquered the province in 1204, and in 1295 it was formally ceded to France. By the peace of Bretigny, in 1360, it again reverted to England, but was soon after retaken by Charles V., who gave it to his brother, the duke of Berri. It was subsequently incorporated with the French crown.

POITRINAL, or PECTORAL, in ancient armor, was the horse's breastplate, formed of metal plates riveted together as a covering for the breast and shoulders.

POKANOKETS. See MASSACHUSETTS INDIANS.

POKE, the common name for *phytolacca decandra*, called also gayet, pigeon berry and scoke, the only representative in America of a small apetalous family, *phytolaccaceæ.* It is found also in n. Africa, the Azores, China, and the Sandwich islands, and has been naturalized in southern Europe and the West Indies. Phytolacca decandra grows on roadsides, farmyards, and uncultivated fields. It has a stem from four to nine ft. high, bearing alternate, ovate-oblong acute leaves, with large petioles; calyx of five rounded and petal-like sepals, stamens 10, styles 10. The flowers, with white calyx and green ovary, grow on terminal racemes, which become lateral and opposite the leaves. It commences blossoming in June. The green ovary develops into a depressed globose five to ten-celled berry, with a single vertical seed in each cell. The berry ripens in Aug. and Sept., becoming a very dark purple, filled with crimson juice. The young shoots are often collected in the spring, and eaten as a substitute for asparagus, or cabbage sprouts. The root is large, fleshy, conical, and branched, being at the largest part often more than four in. in diameter. When dried, as seen in commerce, it is longitudinally wrinkled, brownish, yellowish gray-externally, breaking with a fibrous fracture. Internally it is of a dingy white color, possessing little odor. The taste is at first somewhat sweet, afterward acrid. It contains tannin, starch, resin, malate of lime, and other common constituents of plants, but no active principle has yet been separated. The powdered root is emetic and purgative in doses of one or two drams, and two teaspoonfuls of the juice of the fresh root has produced similar effects. It requires an hour or two for an ordinary dose to have its effect. An overdose, besides the effects

above named, causes great prostration of the nervous system, coldness and blueness of the skin, feebleness of the pulse, drowsiness, dimness of vision, coma, and sometimes convulsions. It has produced tetanic symptoms in a child, which, however, recovered. These effects are not produced unless more than thirty grains of the powdered root are given. It has been used in rheumatism, diseases of the skin, such as *scabies, tinea capitis, sycosis favus,* and *mange* in dogs, both internally and in the form of an ointment made of the powder, in the proportions of one part of the powder to eight of lard.

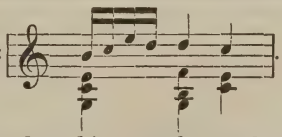
POKER, a game introduced into the United States about the year 1835. The form of the game most popular at the present time is termed *draw poker,* to distinguish it from *twenty-deck poker.* It was formerly played with 20 cards, excluding *all below* the tens, the number of players being two, three, or four, who were confined to the cards first dealt. The entire pack is now used, cards being drawn from it to improve the game originally dealt to the players. The relative value of hands in their order, beginning with the best, is as follows: 1. A sequence flush of five cards, all of the same color; 2. Fours, which is four of the same denomination; 3. A full, consisting of three cards of the same denomination and two of likewise equal denomination; 4. A flush, containing all five cards of the same suit; 5. A sequence, containing all five cards in sequence, but not of the same suit; 6. Threes, with three cards of the same denomination, and two of different denomination from each other; 7. Two pairs; 8. One pair; 9. When a hand does not contain any of the above, the count is by the cards of highest value. In estimating the value of a sequence, an ace counts either as the highest or lowest card, that is, above a king or below a deuce. When two persons hold each a pair, or two pairs, of the same value, the next highest card or cards in each hand must be compared to determine who wins. An excellent pamphlet on the rules of draw poker was published in London by R. C. Schenck, in 1874. The game is unfortunate in its facilities for gambling.

POKHURN, a t. of India, in the Rajpoot state of Jodhpoor, 340 m. s.w. of Delhi. It is situated close to a deserted town of the same name, the site of which is marked by a very conspicuous temple in an elevated situation. Pokhurn has a considerable trade and a pop. of about 15,000.

PO'LA, the chief naval station of Austria-Hungary, and one of the most beautiful havens in Europe, belongs to the margraviate of Istria. The town occupies an eminence overlooking the Adriatic sea, 19 m. s.s.e. of Rovigno. The bay is thoroughly sheltered, and is spacious enough to accommodate the largest fleet. The town is surrounded by bastioned walls, is protected by numerous batteries, and is overlooked by the citadel by which it and the bay are commanded. Pop. '90, 31,623.

Pola, a very ancient town, is said to have been founded by the Colchians, who were sent in pursuit of Jason. It was destroyed by Julius Cæsar, but rebuilt by Augustus at the request of his daughter Julia, on which account it was named *Pietas Julia.* In ancient times it had 30,000 inhabitants, and was a station of the Roman fleet. It contains numerous and interesting Roman remains, among which are a beautiful and well-preserved amphitheater, 436 ft. long and 346 broad. A temple and several ancient gates are also extant. See Allason's *Antiquities of Pola* (Lond. 1819).

POLACCA, or POLACRE, a species of vessel in use in the Mediterranean, with three masts and a jib-boom; the fore and main masts being of one piece ("pole-masts"), and the mizzen-mast with a top and top-mast. They generally carry square sails, though a few are rigged with a peculiar form of sail to which the term *polacre* is also applied. The fore and main masts have, of course, neither tops, caps, nor cross-trees.

POLAC'CA, or POLONAISE', a Polish national dance of slow movement in $\frac{3}{4}$ time. It always begins and terminates with a full bar, and a peculiar effect is produced by the position of its cadence, the dominant seventh in the second crotchet of the bar preceding the triad on the third crotchet:  . The characteristic features of the polacca are sometimes adopted in a rondo, or other lively and brilliant composition, which is then said to be written *alla polacca.*

PO'LAND, called by the natives *polska* (a plain), a former kingdom of Europe—renowned, in mediæval history, as the sole champion of Christendom against the Turks; and, till recently, an object of general and profound sympathy throughout western Europe, from its unprecedented misfortunes—was, immediately previous to its dismemberment, bounded on the n. by the Baltic sea from Dantzic to Riga, and by the Russian provinces of Riga and Pskov; on the e. by the Russian provinces of Smolensk, Tchernigov, Poltava, and Kherson; on the s. by Bessarabia, Moldavia, and the Carpathian mountains; and on the w. by the Prussian provinces of Silesia, Brandenburg, and Pomerania. Its greatest length from n. to s. was 713 English miles; and from e. to w., 693 miles, embracing an area of about 282,000 English sq.m.; an area which, in 1880, had a population of 24,000,000. This extensive tract forms part of the great central European plain, and is crossed by only one range of hills, which springs from the n. side of the

Carpathians, and runs n.e. through the country, forming the water-shed between the Baltic and Black sea rivers. The soil is mostly a light fertile loam, well adapted for the cereal crops, though here and there occur extensive barren tracts of sand, heath, and swamp, especially in the eastern districts. Much of the fertile land is permanent pasture, which is of the richest quality; and much is occupied with extensive forests of pine, birch, oak, etc. Rye, wheat, barley, and other cereals, hemp, wood and its products, honey and wax, cattle, sheep, and horses, inexhaustible mines of salt, and a little silver, iron, copper, and lead, constitute the chief natural riches of the country; and for the export of the surplusage of these products, the Vistula, Dnieper, Duna, and their tributaries afford extraordinary facilities.

The kingdom of Poland, during the period of its greatest extent, after the accession of the grand-duchy of Lithuania in the beginning of the 15th c., was subdivided for purposes of government into about 40 palatinates or voivodies, which were mostly governed by hereditary chiefs. The people were divided into two great classes—nobles and serfs. The noble class, which was the governing and privileged class, included the higher nobles, the inferior nobles (a numerous class, corresponding to the knights, gentry, etc., of other countries), and the clergy, and numbered in all more than 200,000; the serfs were the merchants, tradesmen, and agriculturists, and were attached, not, as in other countries, to masters, but to the soil. The serfs were thus much less liable to ill-usage, and retained more of human energy and dignity than the generality of slaves. The nobles were the proprietors of the soil, and appropriated the larger portion of its products, the serfs in many cases receiving only as much as was necessary for the support of themselves and their families. The nobles were chivalrous, high-spirited, hospitable, and patriotic; the serfs, who had also a stake, though a small one, in the independence of the country, were patriotic and good-natured, but sluggish. The present population of the provinces included in the Poland of former days consists of Poles, Lithuanians, Germans, Jews, Russians, Roumanians, gipsies, etc. The Poles, who number 15,600,000, form the bulk of the population; the Lithuanians, 2,100,000 in number, inhabit the n.e. of the country; the Germans, of whom there are 2,000,000, live mostly in towns and in villages apart by themselves, and bear the usual character for economy, industry, and that excessive love and admiration for the "Fatherland," which guided their politics during the last days of Polish independence; the Jews are very numerous, being reckoned at 2,200,000, but here they are poorer and less enterprising than in other countries; the remainder is composed of Russians (who are few in number, excepting in some of the eastern districts), Russian soldiery, Roumans, gipsies, Magyars, etc. Of Roman Catholics, there are about 9,400,000; Greeks, united and non-united, 7,900,000; Protestants (mostly Lutherans and German), 2,360,000; the rest are Jews, Armenians, Moslems, etc.

History.—The Poles are ethnologically a branch of the Slaves (q.v.). The name appears first in history as the designation of a tribe, the Polani, who dwelt between the Oder and Vistula, surrounded by the kindred tribes of the Masovii, Kujavii, Chrobates, Silesians, Obotrites, and others. In course of time, the Polani acquired an ascendency over the other tribes, most of whom became amalgamated with the ruling race, whose name thus became the general designation. Polish historians profess to go as far back as the 4th c.; but the list of rulers which they give are probably those of separate tribes, and not of the combined race now known as Poles. At any rate, the history of Poland, previous to the middle of the 9th c., is so largely adulterated with fables, as to be little trustworthy. Ziemovicz, said to be the second monarch of the Piast dynasty, is considered to be the first ruler whose history is to any extent to be relied upon; and it was not till a century after, when his descendant, Micislas I. (962–92), occupied the throne, and became a convert to Christianity, that Poland took rank as one of the political powers of Europe. Micislas (as was the general custom among the Polish rulers), divided his dominions among his sons; but one of them, Boleslas I. (992–1025), surnamed "the great," soon reunited the separate portions, and extended his kingdom beyond the Oder, the Carpathians, and the Dniester, and sustained a successful war with the emperor Henry II. of Germany, conquering Cracovia, Moravia, Lusatia, and Misnia. He also took part in the dissensions among the petty Russian princes. Under him, Poland began to assume unity and consistency; commerce, the impartial administration of justice, and Christianity were encouraged and promoted; and about the same time, the distinction between the nobles or warrior class (those who were able to equip a horse) and the agriculturists was distinctly drawn. Boleslas was recognized as "king" by the German emperors. After a period of anarchy, he was succeeded by his son, Casimir (1040–58), whose reign, and that of his warlike son, Boleslas II. (1058–81), though brilliant, were of little real profit to the country. The latter monarch having with his own hands murdered the bishop of Cracow (1079), Poland was laid under the papal interdict, and the people absolved from their allegiance; Boleslas accordingly fled to Hungary, but being, by order of the pope, refused shelter, he is said to have committed suicide (1081). Boleslas III. (1102–39), an energetic monarch, annexed Pomerania, defeated the pagan Prussians, and defended Silesia against the German emperors. A division of the kingdom among his sons was productive of much internal dissension, under cover of which, Silesia was severed from Poland, though still nominally subject to it. Ultimately, Casimir II. (1177–94) reunited the severed portions, with the excep-

tion of Silesia, and established on a firm footing the constitution of the country. A senate was formed from the bishops, palatines, and castellans, and the rights of the clergy and of the peasantry were accurately defined. His death was the signal for a contest among the various claimants for the throne, which was speedily followed, as usual, by a division of the country, and during this disturbance Pomerania emancipated itself from Polish rule. About the same time, the Teutonic knights were summoned by the duke of Masovia to aid him against the pagan Prussians; but they soon became as formidable enemies to Poland as the Prussians, and conquered great part of Podlachia and Lithuania. The Mongols swept over the country in 1241, reducing it to the verge of ruin, and defeating the Poles in a great battle near Wahlstatt. From this time, Poland began to decline; various districts were ceded to the markgrafs of Brandenburg, while many districts began to be colonized by Germans. Numbers of Jews, persecuted in western Europe about this time, took refuge in Poland. Wladislas (1305–33), surnamed *Lokietek* (the short), again restored unity to the country, judicial abuses and all illegally acquired privileges were abolished, and the first diet (1331) assembled for legislative purposes. In conjunction with Gedymin, grand duke of Lithuania, a vigorous war was carried on against the Teutonic knights, on returning from which the aged monarch (he was now 70 years old) experienced a triumphant reception from his subjects, who hailed him as the "father of his country." His son, Casimir III. the Great (1333–70), greatly increased the power and prosperity of Poland by cultivating with zeal the arts of peace, amending the laws, and consolidating his territories by profitable exchanges with the neighboring powers. In the latter part of his reign, he was compelled to defend sundry new acquisitions against the Tartars, Lithuanians, and Wallachians, which he did successfully. With Casimir, the Piast dynasty became extinct, after a sway of 510 years, according to the old Polish chroniclers. His nephew, Lewis the great, king of Hungary, succeeded him, by the will of the deceased monarch and the election of the diet; but during his reign, Poland was treated merely as an appanage of Hungary. On his death without male heirs, the crown fell to Jagello (Wladislas II.), grand duke of Lithuania, the son-in-law of Lewis, who founded the dynasty of the *Jagellons* (q.v.) (1386–1572), and for the first time united Lithuania and Poland, thus doubling the extent, though not the population of the kingdom. However, his successor, Wladislas III., was acknowledged only in Poland proper, the Lithuanians preferring the rule of the younger son, Casimir. Wladislas was also chosen king of Hungary, and fell at the battle of Varna, being succeeded in Poland by Casimir IV. (1444–92), who again united it to Lithuania. Casimir recovered west Prussia from the Teutonic knights, and compelled them to do homage for east Prussia, rewarding the inferior nobles, or warrior class, with more extensive privileges, putting them on an equality of rank with the great chiefs of the realm, and at the same time necessarily oppressing the peasantry. Manufactures and commerce revived to a wonderful extent during his reign in the western provinces. The brief reigns of his three sons were marked only by the increased power of the two houses of the diet, which had by this time absorbed all but the symbols of supreme authority, and had converted Poland from a monarchy to an oligarchy (the king possessing little power beyond what his personal influence gave him). Sigismund I. (1506–48) surnamed the great, the fourth son of Casimir, raised the country to the utmost pitch of prosperity. Generous and enlightened, he was beloved by the masses, whom he endeavored to benefit physically and mentally, while his firmness and justness commanded the respect of the turbulent nobles. He wisely kept aloof from the religious quarrels which distracted western Europe, by allowing his subjects perfect freedom of choice in matters of religion; he was, however, forced into a war with Russia, in which he lost Smolensk; but he was partly compensated by obtaining lordship over Moldavia. His son, Sigismund II., Augustus, was a successor worthy of him. During his reign many abuses were rectified, and the extraordinary privileges of the higher nobles were curtailed or abolished; Lithuania was finally joined indissolubly to Poland, and from this time there was to be but one diet for the united realm; each retained, however, its own army, titles, treasury, and laws. Lithuania was at the same time reduced by the annexation of Podlachia, Volhynia, and the Ukraine, to Poland. Livonia was conquered from the Knights Sword-bearers (a community similar to, though much less distinguished than the Teutonic knights); and the power, prosperity, and opulence of the state seemed to guarantee its position as the most powerful state in eastern Europe for a long time to come. The population almost doubled itself under the two Sigismunds; but this dynasty, whose sway was so happy for Poland, ceased with them; and the warrior class having tasted the sweets of freedom, determined to preserve it by rendering the monarchy elective. The election was made by the two chambers of the diet—viz., the senate or chamber of the chief nobles, and the chamber of nuncios, or representatives of the inferior nobles. He who was chosen king possessed the right of assembling the diet, but had to give a list of the subjects to be discussed; and the representatives, before setting out, were instructed as to the side they were to support. The diet only lasted six weeks, and its decisions were required to be unanimous; so that if the *liberum veto* (the right of forbidding the passing of any measure) were freely exercised even by a single member, all legislation was at a standstill. The evil effects of these regulations were not so much felt at first, as the members

were characterized by honesty and zeal for the general good; but latterly, when venality and subservience to the neighboring powers began to show themselves, all the measures necessary for protecting Poland from dependence on her neighbors were, by a few corrupt and treacherous representatives, rendered of no avail. The first elective monarch was Henry of Valois (III. of France, q.v.), who, however, soon abandoned the throne for that of France, and was succeeded by Stephen Battory (1575–86), voivode of Transylvania, a man of energy and talent, who carried on war successfully against the Russians, who had attempted to seize Livonia, pursued them into the very heart of their own country, and compelled the czar to sue for peace; he also subdued the semi-independent Cossacks of the Ukraine, and to some degree introduced civilization among them. His successor, Sigismund III. (1586–1632), who was succeeded by his sons, Wladislas IV. (1632–48) and John Casimir (1648–72), was of the Vasa family, and was the crown-prince of Sweden; but his election, far from cementing a bond of union between the two countries, only imbittered former dissensions. These three Swedish monarchs were most unworthy successors to Poland's ablest king, as they had neither talents for governing, nor characters and sentiments congenial to a warlike nation; on the contrary, their policy was weak, tortuous, and vacillating. Yet they were always quarreling with their neighbors, declaring war with Russia, Sweden, or Turkey, in the most imprudent and reckless manner, and often without valid pretext. But the Polish armies, though as little fostered and cared for as the other portions of the nation, were everywhere victorious; the Swedish and Muscovite armies were successively annihilated; Moscow was taken, and the Russians reduced to such an abject condition, that they offered to make Sigismund's son, Wladislas, their czar. Sweden made a similar offer to another son of the Polish monarch; but the latter's absurd behavior lost for Poland this rich result of her great victories; and the foolish policy of the whole three not only rendered fruitless all the lavish expenditure of Polish blood and treasure, but lost to the country many of her richest provinces, and left her without a single ally; while their religious bigotry commenced that reign of intolerance and mutual persecution between the various sects which was the immediate cause of Poland's downfall. To show the power of the Poles at this period, it will be sufficient to notice that Great Poland, Little Poland (Galicia, Podolia, Ukraine, etc.), Livonia, Lithuania, (including Samogitia and Black and White Russia, Polesia, and Tchernigov), Pomerelia and Ermeland, Courland, Moldavia, Bukovina, Wallachia, Bessarabia, and Prussia, were either integral parts of the Polish monarchy, or were subject to it. The imprudent attempts of the Swedish sovereigns to amend the constitution only excited the suspicion of the nobles, and led to a further curtailment of royal authority. During the reign of this dynasty, Wallachia and Moldavia were snatched by the Turks from under the Polish protectorate; Livonia with Riga was conquered (1605–21), along with part of Prussia (1629), by Sweden; and Brandenburg established itself in complete independence. The Cossacks, who had been goaded almost to madness by the most atrocious oppression and religious persecution, rose in rebellion to a man, put themselves under the protection of Russia, and ever afterward proved themselves the most inveterate enemies of the Poles. In the reign of John Casimir, Poland was attacked simultaneously by Russia, Sweden, Brandenburg (the germ of the present kingdom of Prussia), the Transylvanians, and the Cossacks; the country was entirely overrun; Warsaw, Wilna, and Lemberg taken; and the king compelled to flee to Silesia. But the celebrated staff of Polish generals was not yet extinct; Czarniecki's sword was as the breath of the destroying angel to Poland's enemies; and after being defeated in detail, they were ignominiously expelled from the country. But in the subsequent treaties, Ducal or east Prussia was wholly given up to Brandenburg; almost all Livonia to Sweden; and Smolensk, Severia or Tchernigov, and the Ukraine beyond the Dnieper, were given to Russia. Michael Wisniowiecki (1668–74), the son of one of the group of famous generals above alluded to, but himself an imbecile, was (contrary to his own wish—for he was well aware of his own deficiencies) elected as their next monarch; a war with Turkey, concluded by an ignominious peace, was the chief event of his reign. But the senate rejected the shameful treaty, the Polish army was again re-enforced, the Polish monarch resigned the command to John Sobieski the Hetman (q.v.), and the Turks were routed with great slaughter at Choezim (1673). After some dissensions concerning the election of a successor, John (III., q.v.) Sobieski (1674–96) was chosen; but his reign, though it crowned the Poles with abundance of the laurel wreaths of victory, was productive of no good to the internal administration. As Sobieski's successor, the prince of Conti was legally elected, and proclaimed king; but the cabinet of Versailles allowed this splendid opportunity of becoming supreme in Europe to escape; and Augustus II. of Saxony, a protégé of the house of Austria, entered Poland at the head of a Saxon army, and succeeded in obtaining the throne. Augustus, unlike all his predecessors, never seemed to identify his interests with those of his Polish subjects; and though he gained their hearts by promising to reconquer for Poland her lost provinces, yet this promise was chiefly made as an excuse for keeping his Saxon army in the country, in violation of the *pacta conventa* (the "magna charta" of Poland). His war with the Turks restored to Poland part of the Ukraine and the fortress of Kaminiec; but that with Charles XII. brought nothing but misfortune. The war with Sweden was unpopular in Poland; in fact, the Poles of the eastern provinces received Charles with open arms; but his attempt to force upon them Stanislas Les-

zynski as their king severely wounded their national pride. Augustus returned after the battle of Poltava (q.v.); his rival retired without a contest; a close alliance was formed with Russia, and the Russian troops which had campaigned in Poland against the Swedes were, along with his Saxon army, retained. The Poles demanded their extradition, but in vain; and the Russian cabinet interfered (1717) between the king and his subjects, compelling both parties to sign a treaty of peace. This was the commencement of Poland's dependence on Russia, and her consequent decline. By the instigation of Peter the great, the Polish army was reduced from 80,000 to 18,000; and the country was further weakened by the diffusion of effeminacy, immorality, and prodigality, through the evil example and influence of the court. Religious fanaticism also more fully developed its most odious features during his reign, and the massacre of the Protestants at Thorn (1724) and the legalized exclusion of them from all public offices was the result. The succeeding reign of Augustus III. (1733–63) was of the same character; the government fell more and more under Russian influence, and its political relations with other countries gradually ceased. Toward the end of his reign, the more enlightened of the Poles, seeing the radical defects of the constitution, the want of a strong central government, and the dangers of the *liberum veto*, entered into a league to promote the establishment of a well-organized hereditary monarchy. But the conservative or republican party was equally strong, and relied on Russian influence; and the conflict between these parties became more imbittered from the fact that the monarchists supported the Jesuits in disqualifying all dissenters from holding public offices, while the republican party supported the dissidents. The dissidents dated their grievances from 1717, but the great conflict between them and their opponents did not break out till 1763. The cabinets of St. Petersburg and Berlin now (1764) presented to the Poles Stanislas Poniatowski as their king. This gross insult, intensified by the incapacity of Stanislas for such an office, could not be borne in quiet; the king and the Russian ambassador were compelled in the diet to listen to the most spirited protests against Russian interference; but the intense national spirit of the Poles only recoiled upon themselves, for the Russian ambassador craftily incited them to insurrection, and kept alive their mutual dissensions. The monarchic, or Czartoryski party (so called because it was headed by a Lithuanian prince of this name), had succeeded in abolishing the *liberum veto*, and effecting many other improvements; but they at the same time more severely oppressed the dissidents; and Russia, finding that the political policy of this party was speedily releasing Poland from her grasp, joined the party of the dissidents as the champion of religious toleration! Her ambassador caused the chief leaders of the Catholic party to be secretly kidnapped, and sent to Siberia, and compelled the republicans to accept the protectorate of Russia. The "confederation of Bar" (so called from Bar in Podolia) was now formed by a few zealous patriots, an army was assembled, and war declared against Russia. The confederates were supported by Turkey, which also declared war against the czarina; and Russia, alarmed at the appearance of affairs, proposed to the king and diet an alliance, which both firmly refused. Frederic the Great of Prussia, who had formerly gained the consent of Austria to a partition of Poland, now, in 1770, made the same proposal to Russia, and in 1772 the *first partition* was effected; Stanislas and his diet claiming the mediation and assistance of the other powers of Europe without effect. He was forced in the following year to convoke a diet for the purpose of recognizing the claims of the three partitioning powers to the territories they had seized, but few members appeared, and these preserved perfect silence. The territories seized by the three powers were as follows:

	Eng. sq. Miles.	Pop.
Russia	42,000	1,800,000
Prussia	13,000	416,000
Austria	27,000	2,700,000

The whole country was now aroused to a full sense of its danger; and the diet of the diminished kingdom labored to amend the constitution and strengthen the administration by a liberal code of laws and regulations, which gave political rights to the cities, civil rights to the peasantry, and rendered the kingly authority hereditary. In this they were encouraged by Prussia, whose king, Frederic William, swore to defend them against Russia; but in 1791, Catharine II., after great labor, obtained, by means of intrigues and bribery, the services of *five* (out of 200,000) of the Polish nobility, who protested against the new constitution which had just (May 3, 1791) been established, and drew up a document at Targowitz (q.v.), which they forwarded to the Russian court. Catharine, thus armed with a pretext for interference, advanced her army, and Prussia proving traitorous, a second fruitless resistance to the united Prussians and Russians, headed by Joseph Poniatowski (q.v.) and Kosciusko (q.v.), was followed by a *second partition* (1793) between Russia and Prussia, as follows:

	Eng. sq. Miles.	Pop.
Russia	96,000	3,000,000
Prussia	22,000	1,100,000

which the diet were forced to sanction at the point of the bayonet. The Poles now

became desperate; a general rising took place (1794); the Prussians were compelled to retreat to their own country, and the Russians several times routed; but then a new enemy appeared on the scene. Austria was chagrined at having taken no part in the second partition, and was determined not to be behindhand on this occasion; her army accordingly advanced, compelling the Poles to retreat; and fresh hordes of Russians arriving, Kosciusko, at the head of the last patriot army, was defeated; and the sack of Praga, followed by the capture of Warsaw, finally annihilated the Polish monarchy. The *third and last partition* (1795) distributed the remainder of the country as follows:

	Eng. sq. Miles.	Pop.
Russia	43,000	1,200,000
Prussia	21,000	1,000,000
Austria	18,000	1,000,000

King Stanislas resigned his crown, and died broken-hearted at St. Petersburg in 1798. The subsequent success of the French against the Russians, and the tempting promises of the emperor Napoleon to reconstitute Poland, rallied round him a faithful army of patriots, who distinguished themselves in the campaigns of the French against Russia and Austria; but all that Napoleon accomplished in fulfillment of his promise was the establishment, by the treaty of Tilsit (1807), of the *Duchy of Warsaw*, chiefly out of the Prussian share of Poland, with a liberal constitution, and the elector of Saxony at its head. The duchy was an energetic little state, and under the guidance of Prince Joseph Poniatowski, wrenched western Galicia from Austria (1809), at the same time furnishing a numerous and much-valued contingent to the French armies; but the advance of the grand allied army in 1813 put an end to its existence. After the cessions by Austria in 1809, the duchy contained 58,290 English sq.m., with a population of about 4,000,000. Dantzic was also declared a republic, but returned to Prussia (Feb. 3, 1814). The division of Poland was rearranged by the congress of Vienna in 1815, the original shares of Prussia and Austria were diminished, and that part of the duchy of Warsaw which was not restored to Prussia and Austria was united as the *kingdom of Poland* (see next article) to the Russian empire, but merely by the bond of a personal union (the same monarch being the sovereign of each), the two states being wholly independent of and unconnected with each other; and the other parts of Poland were completely incorporated with the kingdoms which had seized them. The partition of Poland, as thus finally arranged, was as follows:

	Extent in Eng.sq.m.	Pop. (in 1859.)	Present Political Divisions.
Russia	220,500	16,000,000	Provinces of Courland, Witebsk, Kovno, Vilna, Grodno, Minsk, Mohilev, Volhynia, Kiev, Podolia; and the *kingdom of Poland* (q.v.).
Prussia	26,000	3,000,000	Posen, most of W. Prussia, and several districts in E. Prussia.
Austria	35,500	5,000,000	Galicia, Bukovina, Zips, etc.

while, as if in mockery of its spirit of independence, the town of Cracow, with a small surrounding territory, was declared free and independent, under the guardianship of Austria. The czar at first gave a liberal constitution, including biennial diets, a responsible ministry, an independent judiciary, a separate standing army, and liberty of the press; and he seemed to take pride in his title of king of Poland; but his brother Constantine, having been appointed military governor, speedily put an end to the harmony between the czar and the Poles, and drove the latter into insurrection. Their discontent at first found vent in secret societies; but on Nov. 30, 1830, Constantine and his Russians were driven out of Warsaw, and a general insurrection of the people, headed by the aristocracy, took place. Prince Czartoryski was appointed president of the provisional government, and military leaders, as Radzivil, Dembinski, Bem, etc., were soon found; but a general want of energy in the administration, dilatoriness on the part of the military leaders, and the checking of the spread of the insurrection till fruitless negotiations had been entered into with Nicholas, were errors fatal to the success of the Poles. From Jan., 1831, till Sept. 8 of the same year, a series of bloody conflicts were fought, in which the Prussians and Austrians, with pitiable subservience, aided the czar. At first the Poles were successful; but the taking of the capital by Paskevitch (q.v.) soon ended the war, which was followed, as a matter of course, by imprisonment, banishment, confiscation, and enforced service in the Russian army. From this time the independence of Poland was suppressed, and in 1832 it was declared to be an integral part of the Russian empire, with a separate administration headed by a viceroy of the czar's choosing; the constitution and laws were abrogated; strict censorship of the press and the Russian spy police system established in all its vigor; the country was robbed of its rich literary collections and works of art; and the most severe and arbitrary measures taken to Russianize the people. The outbreaks of 1833 and 1846 were punished by the gallows. Simultaneous disturbances (1846) in the Prussian and Austrian portions of Poland were summarily suppressed; their leaders in Prussia were imprisoned, and only saved from death by the revolution of Mar., 1848, at Berlin; and those in Austria were butchered by the peasantry, who preferred the Austrian to a national government. On Nov. 6, 1846, the republic of Cracow was incorporated with Austria. After the acces-

sion of the czar Alexander II., in 1855, the condition of the Poles was considerably ameliorated; an act of amnesty brought back many of the expatriated Poles, and various other reforms were hoped for, when, in 1861, another insurrection broke out. Its origin is curious, and gives a thorough insight into the relations between the Poles and their Russian rulers. A large multitude (30,000) had assembled in the neighborhood of the battle-field of Grochow (where two battles had been fought in the spring of 1831) to pray for the souls of those who had fallen; they were engaged in prayer and in singing religious chants, when they were charged by the Russian cavalry and gens d'armes, several of them killed, and numerous arrests made. This event excited intense national feeling throughout the country; and other national demonstrations, attended with similar massacres on the part of the Russians, produced such an intense dislike to the latter that most of the Poles in the Russian service either resigned or deserted. The Russians immediately had recourse to the most severely repressive measures, forbidding all assemblages even in the churches, punishing those who appeared to mourn the death of relatives killed in the previous massacres, or who wore garments of certain shapes or colors. The application of the Polish nation to the czar (Feb. 28) for the re-establishment of the Polish nationality, was rejected, but certain necessary reforms were promised. These reforms were on the whole very liberal, and tended greatly to allay the general excitement; but the Russian government was very naturally not trusted by the Poles, and new disturbances broke out in October of the same year. Poland was then declared to be in a state of siege, and Gen. Luders appointed military commandant under the grand duke Constantine, the nephew of the grand duke Constantine above mentioned. The country continued in a state of commotion without any very decided outbreak; attempts were made to assassinate the grand duke and the other Russian officials; and on Jan. 13, 1863, Lithuania and Volhynia were also put in a state of siege. The committee of the national insurrection issued its first proclamation in Feb., 1863; and a week afterward Mieroslavski raised the standard of insurrection in the n.w., on the Posen frontier. The insurrection committee continued to guide the revolt by issuing proclamations from time to time; and many districts of Augustovo, Radom, Lublin, Volhynia, and Lithuania were speedily in insurrection. It was a mere guerilla war, and no great or decisive conflicts took place; but the sympathy of Europe was largely enlisted on behalf of the Poles. Remonstrances from Spain, Sweden, Austria, France, and Britain conjointly and repeatedly, Italy, the Low Countries, Denmark, and Portugal, were wholly disregarded by the czar's ministers, and mutual reprisals continued; incendiarism and murder reigned rampant; the wealthier Poles were ruined by fines and confiscations; and the whole populations of villages were put to the sword by the Russians; while murders and assassinations marked the reign of terror of the national committee. At last, with the officious assistance of Prussia, and the secret sympathy and support of Austria, the czar's troops succeeded in trampling out (1864) the last embers of insurrection. Great numbers of men, women, and even children, concerned in, or supposed to have favored the revolt, were executed; crowds were transported to Siberia; and these vigorous measures seem to have restored "tranquillity, but it is the tranquillity of the desert." Contemporary with this last outbreak, symptoms of similar disaffection were distinctly noticeable in Prussian Poland, but a strong force of soldiery in the border districts toward Russia prevented any outbreak. It deserves to be noticed that, with the exception of the single revolt of 1846 (which perished almost of itself), no rebellion has ever taken place in the portion of Poland belonging to Austria. See Polish Language and Literature.

POLAND, Kingdom of, a province of European Russia, which was united to that empire in 1815—though the title of kingdom was left, and a peculiar form of government long continued to distinguish it from the other provinces—is surrounded by Prussia, Austria, and western Russia or Russian Poland, and contains 49,157 English sq. m., with a pop. (1894) of 9,134,306. In 1890 there were 6,214,504 Roman Catholics, 1,134,268 Jews, 445,013 Protestants, and 398,885 Greek church (this not counting the troops). The surface of the country is in general very level, with now and then a hill, or rather undulation, which relieves the uniformity of the scene. In Radom, however, there is a range of hills, some peaks of which attain a height of 2,000 ft. above sea-level. The chief river of Poland is the Vistula, which enters the country by its southern boundary, and flows first n. and then n.w., making its exit near Thorn; two of its tributaries, the Wieprs and the Pilica, belong wholly, and third, the Bug, partially, to Poland. The Warla, one of the tributaries of the Oder, drains the w., and the Niemen, the n.e. districts. The Vistula and the Niemen are wholly navigable in Poland; and the Bug, Narew, and Warta are so for a considerable portion of their course. By these means of communication the exports of the country are collected at Dantzic, Stettin, Memel, and Tilsit, on the Baltic, and the imports introduced into the country. The climate is severe, the summers being very hot, and the winters excessively cold. The soil very much resembles that of the other parts of the former kingdom of Poland, producing magnificent crops of wheat, rye, barley, oats, and buckwheat, the usual leguminous plants, hemp, tobacco, flax, and orchard-fruits. In Poland, about 55 per cent. of the land is arable land. Since 1867 Poland is divided for administrative purposes into 10 governments—viz.:

Governments.	Eng. Sq. Miles.	Pop. '90.
Kalisz	4,392	837,317
Kielce	3,897	692,329
Lomza	4,667	608,683
Lublin	6,499	979,700
Piotrkow	4,729	1,091,282
Plock	4,200	701,000
Radom	4,769	782,000
Siedlce	5,535	671,598
Suwalki	4,846	656,932
Warsaw	5,623	1,465,131
Total	49,157	8,485,972

The population is about 169 to the sq. m., being more than three times as dense as that of the rest of European Russia. A large proportion of the country population employ themselves in the rearing and breeding of horses, cattle, and pigs; sheep are not so common; but swarms of bees abound, and there is a large export trade in honey. The population of the towns is largely employed in wool-spinning and the manufacture of woolen cloth, cotton and linen spinning and weaving, the production of liqueurs, oil, vinegar, glass and earthenware, paper, beer and porter, etc. The most of the commerce is in the hands of the Jews. Poland, which had a separate government till 1864, was in that year deprived of the last remnant of its administrative independence. After the suppression of the revolt (see preceding article), the country was placed under eight military governors; in 1867 the administration was committed to a commission sitting at St. Petersburg; and by a ukase, dated Feb. 23, 1868, the government of Poland was absolutely incorporated with that of Russia. The average annual value of Polish industries is $120,000,000 a year, a large sum, considering that the population is chiefly agricultural. There is a university at Warsaw, and there is a large number of high schools, gymnasia and primary schools. There are coal, brown hematite, copper, zinc, and tin mines. See Morfill, *The Story of Poland* (1893).

POLAND, Luke Potter, ll.d., b. Vt., 1815; studied law and was admitted to the bar in 1836; he rose rapidly in the profession, was probate register in 1839, prosecuting attorney in 1843, and in 1848 became a member of the state supreme court. He remained on the bench 16 years, for the last five of which he was chief-justice. In 1865 he was elected U. S. senator to fill a two years' vacancy. From 1867–75 and 1883–85 he was a member of congress, and was prominent among the republican leaders. He d. 1887.

POLAR CIRCLE, or Arctic Circle. See Arctic.

POLAR CLOCK, an instrument invented by sir Charles Wheatstone for telling the time of day by means of light which has been polarized by passing through the atmosphere. The reader of the article Polarization will understand the manner in which the light of the sky is polarized in a direction at right angles to the sun's rays. If the Nicol's prism, which is described in that article, is used as an analyzer and placed with its axis parallel to that of the earth and turned around so as to change its position toward the plane of polarization, there will be a change of intensity of light and color. The same changes will be produced if the axis of the prism is not revolved with respect to the earth, because the earth's axial rotation will change the relative plane of polarization of the sun's rays. These remarks, taken in connection with the article Polarization, explain the principle of the polar clock, whose description by the inventor may be condensed as follows: At the extremity of a vertical pillar a hollow conical tube is mounted upon a hinge so that its axis may be brought, at any part of the earth's surface, parallel with its axis. The plane of the base of the cone consists of a ring in which there is fitted a glass disk, whose plane is, of course, perpendicular to the earth's axis. On the lower half of this disk there is a graduated semicircle divided into 12 parts, indicating the hours from VI. to VI. This ring and glass disk are fixed upon an arm, and cannot be rotated. The other part of the cone, however, whose base fits within the ring, may be revolved on its axis, and in this base there is also fitted another glass disk, in whose center there is a small star, formed of thin scales of selenite, which, when examined by polarized light, exhibits strong contrasts of colors. An index upon the plate is placed in such a position as to be a prolongation of one of the principal sections of the selenite scales or plates. At the smaller end of the conical tube there is a Nicol's prism which has either of its diagonals 45° from the principal section of the selenite plates. Placing the eye behind the Nicol's prism the observer will find that the star will in general be richly colored; but as the tube is turned on its axis the colors will vary in intensity, and in two positions will entirely disappear. In one of these positions a smaller circular disk in the center of the star will be of a certain color, while in the other position it will have the complementary color. This effect is obtained by placing the principal section of the small central disk 22½° from that of the other sections of selenite forming the star. The time is ascertained as follows: the tube is turned on its axis until the color of the star entirely disappears, while the central disk remains red, when the index will point at the hour within a very few minutes. Unlike the sun-dial, the polar clock need not be

placed in the sun's rays; it may stand in the shade of a tree or a building, or at a n. window, and it may be used when the sky is overcast if the obscurity is not great, particularly in the direction of the n. star.

POLAR EXPEDITIONS. Under this head are classed all those voyages of discovery which have been made toward the n. and s. poles, and to the regions within the Arctic and Antarctic circles. The n. polar regions present a much greater land-surface than those round the s. pole, and on this account possess a higher temperature, and offer a more valuable field for discovery, for which reasons, as well as by reason of their greater proximity, polar expeditions have been far more frequently directed to the n. than to the south.

ARCTIC EXPEDITIONS.—Polar expeditions were commenced with a view to discover a shorter route to the golden realms of the east; but the first attempts were made by coasting along the n. of Europe and America. (See NORTH-EAST AND NORTH-WEST PASSAGES.) It was not till 1603 that the first arctic exploring expedition, consisting of one vessel, the *Godspeed*, commanded by Stephen Bennett, started for a voyage of northern discovery; and this, as well as the succeeding expeditions of Bennett, were devoted to morse-hunting rather than to geographical investigation. In 1607 Henry Hudson (q.v.) was sent out by the Muscovy company to penetrate to the n. pole, but he was stopped about the n. of Spitzbergen (in lat. 81° 30′) by the ice. The succeeding voyages of Jonas Poole in 1610, 1611, and 1612, and of Baffin in 1613, were not primarily voyages of discovery, and they added nothing to the previous knowledge of the polar regions; but in the expedition of Fotherby and Baffin up Davis's Strait, in the following year, the latter discovered a northern outlet to the bay called by his own name, which was denominated Smith's sound. Fotherby was sent out again in 1615, and attempted to pass through the sea which lies between Greenland and Spitzbergen, but was again baffled, and compelled to return, after correcting some erroneous observations of Hudson. These seven expeditions were all sent out by the Muscovy company; and the cargoes of seal-skins, oil, teeth, etc., which they brought back helped to defray the expense of their outfit. For the next century and a half the attempts to reach the n. pole were not resumed; but the extraordinary zeal in the cause of naval discovery which sprung up in the beginning of George III.'s reign, produced two renewed efforts. The first of these was made in the spring of 1773 by an expedition consisting of two vessels, under Capt. John Phipps (afterward lord Mulgrave), and fitted out by the admiralty purely for scientific purposes. Phipps sailed along the shore of Spitzbergen till he was stopped by the ice at Cloven Cliff; he then coasted backward and forward along the ice-field for nearly a month, trying the various narrow openings, some of which were two leagues in depth, till he found one which took him into open water. By a sudden change in the climate he was frozen in, and only extricated his ships after severe labor. The highest point to which he reached was lat. 80° 48′ n., less by 49 m. than the most northerly latitude attained by Hudson; and though he had a more than usual amount of difficulties to encounter, yet his failure, along with that of Capt. Cook, who attempted to reach the pole by Behring's Strait, but only penetrated to lat. 70° 45′ n., greatly disheartened other explorers. The offer of £5,000 by the British parliament to the crew that should penetrate to within 1° of the pole, awaked no competition; but in 1806 Mr. Scoresby, then mate of a Greenland whaler from Hull, reached a point directly n. of Spitzbergen, in lat. 81° 30′ n., and therefore only about 510 geographical m. from the pole. In following expeditions the same enterprising navigator made many geographical explorations of Jan Mayen's land and the e. coast of Greenland, largely adding to our knowledge of the character and products of the arctic regions. The subsequent expeditions of Buchan and Franklin in 1818, of Clavering in 1823, of Graab (Danish) in 1828, of De Blosseville (French) in 1833, may be considered as failures, so far as geographical discovery is concerned; for, omitting the French expedition, the fate of which is still involved in mystery, none of them reached so high latitudes as the previous English expeditions. After the failure of Buchan and Franklin's expedition, the impossibility of ever reaching the pole was generally accepted in Gt. Britain as fact; but Mr. Scoresby, in a memoir which he communicated to the Wernerian Society, endeavored to prove that this supposed impossibility was by no means such; in fact, that a journey to the pole could be made without any enormous amount either of difficulty or danger. The principal obstacle to be encountered being the alternation of ice-fields and water, which prevented all advance either by ships or sledges, Mr. Scoresby proposed the use of a vehicle which could be used either as a sledge or boat, and recommended a team of dogs to draw it, they being lighter (for conveyance by water, and for traveling over thin ice) and more tractable than reindeer. After some time this suggestion began to receive a considerable share of attention, and Capt. Parry (celebrated for his discoveries in the polar seas of N. America) was put in command of an expedition fitted out in accordance with Scoresby's plans. He sailed from England in the *Hecla*, on Mar. 27, 1827; but it was June 22 before the exploring party quitted the ship, which was left on the n. shore of Spitzbergen, in charge of a small crew, and betook themselves to the boats; and in spite of the advanced season of the year they in the first two days advanced to 81° 13′. Here they began to encounter many difficulties; the ice-fields were small, and near each other, necessitating a constant conversion of the vehicle from a sledge to a boat, which could not be effected without

unloading it, an operation which consumed much time. This hardship, however, was endurable ; but, to Parry's intense chagrin, he discovered, about July 22, that the ice over which they were traveling was moving southward as rapidly as they were advancing n., so that on the 24th, after having traveled apparently 22 m. in the three previous days, they found themselves in the same latitude as on the 21st. Under these circumstances Parry resolved to return, which he accordingly did, reaching his ship on Aug. 21. The highest point reached by him was 82° 40′. A new land, about 200 m. n. of Nova Zembla, to which the name Franz Joseph Land has been assigned, was discovered by the Austro-Hungarian polar expedition of 1872–74, under Lieuts. Weybrecht and Payer. Its s. coast lies about the 80th parallel, and it was explored, by means of sledges, up to 82° 5′ n., while land was seen extending as far as 83° north. In 1854 two American explorers passed through Smith Sound, and reached Cape Constitution in 82° 27′ n. lat. and saw, as they thought, a boundless open polar sea. The *Polaris* sailed in July, 1871, from New London, Conn., and reached 82° 16′ north. The supposed polar sea being a sound entering Kennedy Channel, gave hopes of reaching the pole through Smith Sound. An English arctic expedition under Capt. Nares sailed in 1875, and, through Smith Sound, reached the highest latitude till then attained, 83° 20′. Unable to penetrate further, it returned in 1876. In the year 1860 Dr. Isaac I. Hayes had made an expedition to Smith Sound ; and, by sledge, to a point as far n. as 82.45 ; and in 1869 visited Greenland, and explored a considerable portion of its southern coast. See Hayes, Isaac I. Unsuccessful efforts were made to reach the n. pole by way of Barentz Sea, from 1857 to 1867, by the Swedes, Germans, and Austrians ; the German geographer, Petermann, having given the weight of his authority to the opinion that this was the most feasible route. Capt. Hall made his first expedition in 1860 ; and his last, on the *Polaris*, in 1870. See Hall, Charles Francis. He added materially to the existing geographical knowledge concerning the arctic regions, and gained valuable information regarding the fate of the Franklin expedition. In 1875, '76, and '78, Prof. Nordenskjöld explored from the Norwegian coast by way of the Kara Sea, and past the mouth of the Lena River, skirting the whole of Siberia to Behring's Straits, demonstrating the practicability of making the voyage by this route from Norway to Japan. On July 8, 1879, the *Jeannette*, a bark-rigged steam-yacht of 420 tons burden, sailed from San Francisco for a voyage of exploration to the arctic regions, via Behring s Straits ; the first to attempt it by this route. This expedition was fitted out by James Gordon Bennett, proprietor of the New York *Herald*, and was commanded by Lieut. De Long, U. S. N. Three islands were discovered, the most northerly, in lat 77° 8′ n., long. 157° 32′ e. ; but the ship was crushed by the ice in June, 1881, and the party was forced to retreat to the Siberian coast. Their boats became separated in a gale ; one was lost. De Long and 11 of his companions died of starvation in the Lena Delta.

As nothing had been heard from the *Jeannette* expedition, the American government, in the summer of 1880, sent Capt. Hooper, in command of the *Corwin*, to look for it, and for several whaling ships in the polar seas, from which no tidings had come. Capt. Hooper returned, Oct. 12, having seen nothing of the missing vessels. In 1881 five expeditions were sent out by the United States. The *Rodgers*, in charge of Lieut. Berry, was to find the *Jeannette*, and the whalers, *Mt. Wolloston* and *Vigilant ;* the *Corwin*, under Capt. Hooper, and the *Alliance*, in charge of Commander Wadleigh, besides having other missions, were to aid in the search. In addition, two parties were sent to occupy the two international polar stations—one to Pt. Barrow and the other to Smith Sound. According to the agreement made at the International Polar Congress, held in 1880, Russia was to establish two stations ; Norway, Sweden, Holland, Austria, and Denmark, one station each. The observations were to begin after 1881, Aug. 1, and to continue till 1883, Sept. 1. France and Germany sent parties to the south polar regions. There were to be meteorological, magnetic, electric, and pendulum observations. Lieut. Greely and party were landed at Lady Franklin Bay, 1881, Aug. 11, and were to remain there till 1883. In the mean time news came from the *Jeannette* party ; the ship had been crushed by ice, 1881, June 13, and part of the crew in two boats reached the mouth of the Lena River, made their way through northern Siberia to the Russian settlements, only 12 surviving the journey. In 1882 observations were being made at 15 of the polar stations. The relief expedition sent in 1882 to the Greely party failed to reach them on account of the ice, and again, in 1883, the expedition under Lieut. Garlington in the *Proteus* and *Yantic* failed. The *Proteus* was crushed by the ice, and after, with much difficulty, leaving 500 rations near Cape Sabine, Garlington and his men reached the *Yantic* and returned to St. John's, N. F. The Greely party having had no relief since they were sent out, their condition excited great anxiety and sympathy, and in 1884 three thoroughly equipped vessels were sent in search, finding and rescuing the starving remnant of the party—seven persons—June 22, near the mouth of Smith Sound.

Antarctic Expeditions.—The attempts to penetrate to the s. pole are of very recent date, mainly because a knowledge of the southern polar regions is only valuable to Europeans from a scientific point of view. Cook and Furneaux are the first navigators who are known to have crossed the antarctic circle, but the former penetrated only to lat. 71° 10′ s., and neither made any discoveries of importance. Bellinghausen, a Russian navigator, reached lat. 70′ s. in 1819, and two years after discovered Alexander's Land and Peter's Land, then the most southerly islands known. In 1823 Capt. Weddell

reached lat. 74° 15′ s., long. 34° 16′ w., and saw beyond him an open sea to the s., but made no important additions to our geographical knowledge. In 1831 Capt. John Biscoe discovered Enderby Land; and in 1839 the sealing-schooner *Eliza Scott*, from New Zealand, discovered Sabrina Land (q.v.); and in the same year the U. S. expedition, under Capt. Wilkes, set out on a career of exploration, which resulted in the discovery (Jan., 1840) of what he with reason supposed to be a continuous coast-line, though an ice-line of from 8 to 12 m. in width prevented him from establishing its continuity beyond dispute. The (supposed continental) coast stretched from Ringold's Knoll on the e. to Enderby land on the w., and was distinguished by the absence of currents to disturb the ice-barrier, and by a much less precipitous character than belongs to islands. In 1840 a French expedition, under D'Urville, discovered a line of coast lying directly s. from Victoria (Australia) on the antarctic circle. But the most important discoveries of all were achieved by Capt. (afterward sir James) Clarke Ross, who made three several voyages in 1841–43, discovering Victoria Land (q.v.), and tracing its coast from lat. 71° to lat. 78° 10′ (the highest southern latitude ever attained). In his third voyage Ross proved that the lands discovered by D'Urville were islands of inconsiderable magnitude; and his antarctic expedition has besides supplied much important information to the students of natural history, geology, and, above all, of magnetism (q.v.). Ross's geographical discoveries have since been confirmed.

In 1889 Fridtjof Nansen (q.v.), made a successful trip across Greenland, as the result of which he made, in 1893–96, a new polar expedition. In 1891, Lieut. R. E. Peary, U. S. N., carried out a preliminary voyage to the polar region. The experience thus acquired he sought to utilize in a second expedition, which, after elaborate preparation, he began in 1893, his intention being to remain at the north for several years.

POLARISCOPE, an instrument used for testing the amount of polarization in a beam of light. See POLARIZATION OF LIGHT. As polarization of light consists in reducing the luminous vibrations to one plane, that part of a polarizing apparatus—of which there are several kinds—which is called the analyzer performs the office of a polariscope; but to make an efficient instrument, several additions are required. There are different forms. In Arago's polariscope a plate of quartz cut across its axis is placed in one end of a tube, which carries at the other end a double refracting prism, by means of which two images are seen, which in common light are colorless, but in polarized light exhibit complementary colors. In the saccharimeter of Soleil there is a disk of rock crystal made of two semicircular plates respectively cut from crystals of right and left-handed rotatory power. This disk produces the best effect when of a thickness of 0.148 of an inch. When common light passes through this disk, and then through an analyzer, it does not become colored; but if it has been polarized, that is, reduced to vibrations in one plane, the two semicircles of which the disk is composed will exhibit complementary colors, except in one position, when the tint will be the same in both. Any alteration in the power of the medium through which a polarized ray passes to turn the plane of polarization to the right or to the left will cause a reappearance of color, and therefore this instrument is useful in examining sugars. See SACCHARIMETER,

POLARITY. The n. and s. poles of the earth's axis are familiar terms, and so are the derived terms of the n. and s. poles of a magnet (see MAGNETISM). A right-handed and a left-handed corkscrew, or helix, are also perfectly well known. The distinction between the members of any of these pairs leads us to the consideration of polarity, which it is difficult to define except by illustrations. In the case of the helix, it is the difference between right-handed and left-handed; not as in a magnet, the difference between the two ends. If we look closely into the question, we find that it is impossible to define the term "right-handed rotation" in the abstract. We may define it as being the same as that of the hands of a watch, or that of the apparent motion of the celestial bodies about us *in this northern hemisphere;* but to a person at the equator, or to one who had never seen a watch, such comparisons would be without meaning. In fact, it is impossible to give a definition of even such a simple term as *right, down, east,* etc., independent of reference to the motion or position of some external object. But there is, in many cases, an important scientific reality underlying, and perhaps causing these difficulties. To a spectator looking down upon the n. pole of the earth, the axial rotation would appear to be left-handed, or opposite to that of the hands of a watch; while at the s. pole the appearance is the reverse. In fact, as motion in a horizontal straight line appears to be from right to left, or from left to right, according to the side on which the spectator stands; so motion in a curve appears to be right-handed or left-handed, according to the side of its plane from which it is looked at. And this is now known to be the cause of the difference of poles in a magnet; the hypothesis of two magnetic fluids is dismissed, and Ampère's explanation, that in a magnet currents of electricity revolve round each particle in planes perpendicular to the direction of magnetization, at once accounts for the dissimilarity of the poles. Such a figure as this gives a clear idea of the subject. A little electric current, such as that in the figure, in which positive electricity passes in the direction indicated by the arrow-head, acts upon external bodies exactly as a small magnet would whose axis is, as in the cut, perpendicular to its plane, the arrow-head representing the *north* pole; that is, the pole which turns toward the *south.* Again, an electric current passing in a straight wire would at first sight appear to be altogether independent of polarity; yet it is found that such a current moving in the *straight* line in the cut, in

the direction of the arrow-head, tends to make the *north* pole of a magnet rotate round it in the direction indicated by the arrow-head in the circle. Again, there are certain crystals which, when heated, become electric. One end of a prism of tourmaline, for instance, takes positive, the other negative, electricity.

POLARIZATION OF LIGHT. A ray of light from the sun or a lamp, which has not been reflected or refracted in its course to the eye, possesses no properties by which one *side* of it can be distinguished from another; if, for instance, it be divided into two by a colorless doubly-refracting crystal, such as Iceland spar, these two rays will be of apparently equal intensity in whatever position the crystal be placed (REFRACTION, DOUBLE). But if the ray has been reflected from a surface of glass or water, it is found that in general the intensities of the two rays into which it is divided by the doubly-refracting crystal are not only unequal, but dependent upon the position of the crystal with reference to the plane in which the light was previously refracted or reflected. This is a conclusive proof that the light has undergone some change by reflection or refraction, so that it is no longer the same all round, but possesses *sides* (in the language of Newton), or (in modern phraseology) is *polarized.* Perhaps the most complete illustration of this very important fact is to be found by using two doubly-refracting bodies—two small crystals of Iceland spar, for instance—and pasting on a side of one of them a slip of paper with a pin-hole in it. On looking through this crystal, the covered side being turned toward a bright body, we see two images of the pin-hole, *equally* bright. Look at these through the second crystal, each is in general doubled; we see four images of the pin-hole, but these are generally *unequal* in brightness; and by turning either of the crystals round the line of sight as an axis, we find that there are positions, at right angles to each other, in which only *two* images are visible. If we turn further, the lost images appear faint at first, and gradually becoming brighter, while the others become fainter in proportion; till, when we have completed a quarter of a revolution, the new images alone remain, the others having disappeared. From this it follows that each of the rays into which a single beam of light is decomposed by double refraction possesses *sides,* or is polarized; and to such an extent as to be incapable of being again doubly refracted in certain positions of the second crystal. By taking advantage of the difference of the refractive indices (REFRACTION) of the two rays produced by Iceland spar, and the close agreement of one of them with that of Canada balsam, Nicol constructed his "prism," which is one of the most useful pieces of polarizing apparatus. It consists of two pieces of Iceland spar cemented with Canada balsam, and *allows only one of the two rays produced by double refraction to pass through.* When we look at a flame through two Nicol's prisms in succession, we find that the amount of light transmitted depends on their relative position. If they are *similarly* placed, we have the maximum amount —viz., half the incident light; if they are *crossed,* that is, if one be made to rotate through a right angle from the position last mentioned, *no* light, not even the most powerful sunlight, can pass through the transparent combination. There are certain doubly-refracting bodies, such as tourmaline, iodosulphate of quinine, etc., which by absorption stifle one of the two rays into which they divide a beam of light, and which act therefore precisely as Nicol's prism does. But they have the great disadvantage of *coloring* the transmitted light very strongly; and this renders them unfit for the study of the gorgeous phenomena of color (perhaps the grandest displays in optics) which are produced by polarized light. But for the verification of the facts to which we now proceed, a tourmaline or a Nicol's prism will do equally well, and will be called the analyzer. And first as to the reflection of light, a cause of polarization first detected by Malus. If we examine by the analyzer light reflected from water, unsilvered glass, polished or varnished wood, jet, etc., we find that it is more or less completely polarized; but that there is a particular angle for each substance, at which if light be reflected (see REFLECTION) from its surface it is completely polarized; that is, can be completely stopped by the analyzer in certain positions, just as a ray which has passed through a Nicol's prism. It was discovered by Brewster that this angle, called the *polarizing angle,* has its tangent equal to the index of refraction of the reflecting body: or, in another form, the reflected light from a surface of glass, water, etc., is completely polarized when its direction is perpendicular to that of the corresponding refracted ray. The light reflected from the second surface of a glass plate is also completely polarized at the same angle; and one of the most useful polarizers which can be made is a pile of thin glass plates, from the surfaces of which light is reflected at the proper angle, which is for ordinary window-glass about 54°. The light which passes through the glass plates is partially polarized, and its polarization is more nearly complete the greater the number of plates employed. And it appears that these rays are polarized in planes perpendicular to each other—i.e., that the analyzer which extinguishes the reflected ray has to be turned through 90° to extinguish the refracted ray.

In order that we may arrive at some ideas as to the nature of polarization, we must consider on the basis of the undulatory theory of light (q.v.) *how* a ray of light can have sides. If we take, for a comparison, waves of sound, as we know that in them (SOUND) the particles of air move back and forward in the line in which the sound travels, we see that a beam of sound cannot possibly have sides, since the motions of the particles of air in it are precisely the same from whatever side we consider them. Next take waves

in water, where we see the water rising and falling as the undulation (*not* the water) travels uniformly onward in a horizontal direction; and this at once gives the required analogy. So far as phenomena of interference (q.v.; see also DIFFRACTION) are concerned, waves, whether in air or in water, present them, so that they merely show us that light depends on undulations, but not the kind of undulation. But when, from the facts of polarization, we find that a ray of light can have sides, we see that the vibrations of the luminiferous medium must be *transverse to the direction of the ray*. Common light, then, consists of vibrations which take place indifferently and in succession in all directions transverse to that of the ray; while light which is completely polarized has its vibrations limited to a *particular* transverse direction. A Nicol's prism allows no light to pass through it except that which vibrates in a particular transverse direction, depending upon the position of the axes of the pieces of Iceland spar of which it is made. Light which has passed through one Nicol's prism is sifted so as to contain none but such transverse vibrations, and will of course pass freely through a second prism, or be completely or partially stopped by it; according as the two prisms are similarly situated, or turned so that the directions of the vibrations they can transmit are inclined at right angles, or at any other angle.

It is not yet settled what the direction of these vibrations is in any particular case; whether they take place *in*, or *perpendicular to*, the plane of polarization; and the point is extremely important in the theory of the subject, though not to the explanation of the ordinary experimental results. To explain the nature of this difficulty, we merely mention the simple case of polarization by reflection at a glass plate. Do the vibrations of the reflected ray take place *perpendicular to* the plane of reflection (i.e., parallel to the reflecting surface), or do they take place *in* the plane of reflection? Some high authorities are in favor of the latter hypothesis, but the general opinion of scientific men at present unquestionably leans to the former. Many delicate experiments have been made to decide the question, but their results have been irreconcilable with each other. From the results which we have just arrived at, it is evident that the oscillations, or vibrations of the luminiferous medium, of which light consists, are similar to those of the bob of a pendulum (q.v.), the ray in this case being supposed to proceed vertically downwards. Polarized light consists of vibrations analogous to those of the ordinary pendulum, backward and forward in a line. But we have seen that any motion of the pendulum may be compounded of two such motions in planes perpendicular to each other. This is analogous to the decomposition of common light by a doubly-refracting crystal into two rays polarized at right angles. But we find in nature, and can produce artificially, motions of the luminiferous medium resembling exactly the elliptic, and circular motions of the (conical) pendulum. They occur in nature in all cases of reflection from metallic surfaces, and also from the surfaces of highly refractive bodies, such as diamond, etc. The easiest artificial method of procuring them is to allow polarized light to pass through a thin plate of a doubly refracting crystal, such as a film of mica. Thus if OA be the direction of vibration of the polarized light, the ray moving perpendicularly to the paper O*a*, O*b*, the directions (at right angles to each other) of vibration of the two rays into which it is divided by the mica, we have only to let fall from A perpendiculars on O*a* and O*b* to determine the extent of the resolved vibrations in these directions. Now if the two rays moved equally rapidly through the mica, they would simply recombine on leaving it into a single plane polarized ray, whose vibrations would be represented by OA as before. But, in general, one of the rays is retarded more than the other, and the combination of two such oscillations is seen by geometrical considerations to give an ellipse whose center is at O, and which touches each side of the rectangle of which A*a* and A*b* are half sides. The limiting forms of these ellipses are, of course, the diagonals of the rectangle; so that there are two cases for the light remaining plane polarized after passing through the mica, for an infinite number in which it will be elliptically polarized. Also the difference of retardation of the two rays may be such as to correspond to a description of these ellipses either right-handedly or the opposite. In particular cases the ellipse may be a circle; then it is obvious that the rectangle must become a square, that the directions of vibration of the two rays in the mica must be equally inclined to that of the original polarized ray, and that one ray must be retarded an odd number of quarter oscillations more than the other. If it be 1, 5, 9, etc., quarter oscillations, the rotation is in one direction; if 3, 7, 11, etc., it is in the opposite. Circularly polarized light cannot be distinguished by the eye, even with the help of a Nicol's prism, from common light; but by the interposition of a thin plate of a doubly refracting crystal, phenomena are produced which common light cannot give. Before we leave this part of the subject, it may be remarked that the composition of two equal and opposite circular vibrations produces a plane vibration, whose plane depends upon the simultaneous positions of the revolving bodies in their circular orbits. Hence a plane polarized ray may always be considered as made up of two circularly polarized rays, and if these pass through a medium which retards one more than the other, the plane of polarization of their resultant, when they leave the medium, will in general not be the same as that of the incident ray. In other words, the plane of polar-

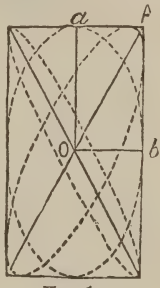


FIG. 1.

ization will have been caused to rotate through a certain angle, which will be proportional to the difference of retardation of its circular components. This is the explanation of what Biot called *rotatory polarization* in quartz, turpentine, sugar, etc., and of the rotation of the plane of polarization discovered by Faraday when a polarized ray passes through a transparent body under the action of a magnet.

In the first of these cases, the retardation is due to molecular heterogeneity; in the second, it depends upon molecular motions produced by the magnet. The effect is greater in each case the more refrangible the rays; and therefore, when the light which has passed through the medium is examined with an analyzer, the successive colors of the spectrum are cut off each at a different angle, and the observed tint is that compounded of those which remain. The saccharometer (q.v.), for the determination of sugar in a liquid, is an application of the first case; the second has not as yet been applied to any practical purpose, but it has given most valuable information as to the ultimate nature of magnetism.

When polarized light passes through a slice of any uniaxal double-refracting crystal, nearly in the direction of its axis, it is obvious that the difference of retardation of the two rays into which it is divided will depend only upon (1) their refrangibility and (2) their inclination to the axis of the crystal. Hence, if we suppose the light to be homogeneous, the effects of interference, and subsequent application of the analyzer, must be to produce appearances of bright and dark spaces, symmetrically disposed round the axis; that is, a series of concentric circular rings. The superposition of the separate sets of rings, for each color of the spectrum, produces the appearance actually observed; a series of colored rings, like those known as Newton's rings, due to interference (q.v.). Besides these, however, there is a dark or bright cross, consisting of two black or white bands, intersecting each other in the common center of the rings. The dark bands are due to the absolute stoppage by polarizer or analyzer, when placed in positions 90° from symmetry, of all light whose vibrations are executed in the principal planes of the polarizer and analyzer. A similar explanation applies to any other case. The system of colored rings thus produced is one of the most splendid results of the optical combinations yet produced; and may be seen by any one by the help of such simple apparatus as two fragments of window-glass and a piece of clear ice from the surface of a pond. In undisturbed freezing, the axis of the ice crystal is perpendicular to the surface of the water, and the cake of ice is therefore, as it were, cut for our purpose. If light be reflected at an angle of about 54° from the first piece of glass, pass perpendicularly through the ice, and be again reflected (at 54°) from the second piece of glass, the phenomena above described will be at once seen, the appearances varying with the relative position of the planes in which the reflections take place from the pieces of glass. If these planes be at right angles to each other, we have the black cross as in figure 2; if parallel, a white cross.

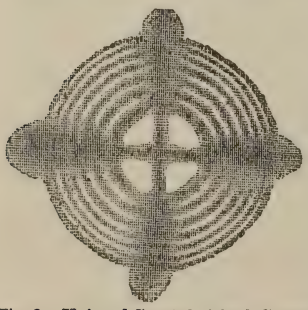


Fig. 2.—Uniaxal Crystal; Black Cross.

If, instead of a uniaxal crystal, a biaxal crystal, such as nitre or arragonite, be employed, the system of colored rings and dark brushes is more complex; symmetry now requiring their arrangement about the *two* optic axes. The general appearance of the rings and brushes depends now, not only on the relative position of the polarizer and analyzer, but also on the position of the crystal (which is no longer symmetrical about an axis) with reference to these planes.

By employing circularly or elliptically polarized light, the appearances may be still further varied, but we cannot enter into details.

Every doubly refracting body produces a change upon polarized light which passes through it. Hence the application of the polarizer and analyzer (usually glass mirrors, or Nicol's prisms) to the microscope is often of very great use in detecting crystalline, and other structural peculiarities. Solid bodies, such as glass, which are singly refractive, become doubly refractive when strained either by external forces or by unequal heating. A permanent state of strain is produced in glass when it is cooled quickly. All these phenomena are beautifully exhibited by polarized light. Again, the application of polarized light is sometimes of great importance in qualitative analysis, where only an exceedingly small quantity of a substance is procurable for examination, by enabling the chemist to determine whether a minute crystal is doubly refractive or not.

A practical application of a polarizing prism may be mentioned. In salmon spearing it is often exceedingly difficult to see the fish at the bottom of the stream, on account of the glare of light reflected from the surface. But as this light is always partially, sometimes wholly polarized, a great part of it may be arrested by the analyzer held in a proper azimuth; while the light escaping from the water will suffer little loss.

The light of the sky, being mainly reflected light, is of course partially polarized. The investigation of this subject has been most ably conducted by Brewster (*Trans. R. S. E.*, 1862–63).

POLDER, a word used in the topography of the Netherlands, is the name given to land below the level of the sea or nearest river, which, originally a morass or lake, has been drained and brought under cultivation. An embankment, forming a canal of sufficient height to command a run toward the sea or river, is made, and when carried quite round, as in the case of the Haarlem lake, it is called the *ringvaart* At one or more points on the embankment apparatus for lifting water is placed, and worked by wind or steam power. If the lake deepens toward the center, several embankments and canals are necessary, the one within the other, formed at different levels as the water-surface becomes lessened, a connection being maintained with the outer canal, which secures a run for the drainage water. In the Schermer polder, north Holland, are four canal levels, the land between forming long parallelograms. The water from the inner space is lifted into the first canal; that again, with the drainage of the second section, is thrown into the second, and so on until the outer canal is reached, and a fall obtained. The Netherlands polders are very numerous. The Beemster, a rich district of north Holland, till 1612 water, is crossed at right angles by fine avenues, and dotted with farm-houses and orchards. In 1865, pop. 3,938. The Zype, Schermer, and Purmer are fertile polders, but the most important is the drained Haarlem lake (q.v.). The land reclaimed amounted to nearly 50,000 acres, and, in 1875, had a pop. of 12,570, with 2,867 horses, 5,897 head of horned cattle, 7,923 sheep, etc. There were in cultivation—colza, 633 acres; madder, 318; flax, 2,572; beans, 2,353; potatoes, 737; wheat, 4,562; rye, 2,302; barley, 2,145; oats, 12,734; beet, 400; peas, 737; mustard, 95; canary seed, 42; and other crops, 270. In 1874 in the Haarlemmeer were 644 births, 334 deaths, and 95 marriages. In connection with the new canal from the North sea to Amsterdam, several extensive tracts of land have been reclaimed from the Ij, and formed into valuable polders, some of which are now bearing heavy crops.

POLE, Cardinal Reginald, b. in Staffordshire in the year 1500, was the son of sir Richard Pole, lord Montacute, by Margaret, countess of Salisbury, daughter of the duke of Clarence, the brother of Edward IV. His early education was received from the Carthusians at Sheen, whence, being liberally provided for by the king his relative, he passed to Magdalen college, Oxford, and having received deacon's orders, was advanced to several valuable preferments, through the favor of the king, Henry VIII. For the future prosecution of his studies, he went to the university of Paris, and thence to Padua, where he formed the friendship of a distinguished group of scholars and friends, all of whom subsequently took a leading part in public affairs—Contareni, Bembo, Sadoleto, and others. In 1525 he returned to England, where the highest ecclesiastical dignities awaited his acceptance. But it was about this time that Henry had resolved upon the divorce from his queen Catharine, and Pole not only withheld his assistance in carrying out the project, but provoked the undying resentment of the king by his well-known treatise, *De Unitate Ecclesiasticâ*. His preferments and pension were withdrawn, and preparations were made for his impeachment. This, and probably still more extreme measures, he evaded by withdrawing from England. The king's resentment fell instead upon his elder brother, and upon his aged mother, the countess of Salisbury. During the rest of Henry's reign, Pole remained in exile. The pope, for the maintenance of whose authority, in the cause of the injured Catharine, Pole was regarded as a martyr, treated him with distinguished favor, and elevated him to the cardinalate. He was employed in many affairs of the highest importance, being sent as legate, in 1537, to France and the Low Countries, from both which states Henry VIII. in vain demanded his extradition. He also took an active part in the discussion on the interim, and when the council of Trent was opened, he was appointed one of the three legate-presidents who acted in the name of the pope, Paul III. (q.v.). On this pontiff's death in 1549, Pole was all but elected to succeed. For some time after Paul's death, he resided chiefly in a monastery neat Verona, in comparative retirement, until the accession of Mary called him back to active life, as the main instrument of the reconciliation of England with the papacy. On Nov. 24, 1554, Pole solemnly entered London as legate and plenipotentiary of the Roman see, possessing in an equal degree the confidence of the queen. In the arduous charge thus intrusted to him, he acquitted himself with much prudence, and, considering the circumstances of the time, with singular moderation. In the religious or politico-religious severities which marked the later history of Mary's reign, it is all but certain that Pole had no share. He was created archbishop of Canterbury, and chancellor of the universities of Oxford and Cambridge. On the difficult and critical question of the disposal of the church property confiscated in the former reign, Pole, who saw the necessity of moderation, was for a time at issue with the pope; but his representations were successful in producing a more moderate policy, and the work of reunion appeared to proceed with every prospect of a complete permanent issue, when it was interrupted by the death of the queen in 1558. Pole died within less than twenty-four hours afterward. Besides the treatise *De Unitate*, already mentioned, he is also the author of a book *De Concilio*, and of other treatises on the authority of the Roman pontiff and the reformation of England, and of very many most important letters, full of interest for the history of the time.

POLEAXE, a weapon consisting of an axe-head mounted on a long pole. There were many varieties of this arm, passing from a great hand-axe to an axe-headed spear or

halbert, several of the longer sorts bearing but little resemblance to an axe. In the navy, a poleaxe or boarding-hatchet is a hatchet with a handle about fifteen inches long, and a sharp point bending downward at the back opposite the blade. It is used for boarding or resisting boarders.

POLECAT, or FITCHET, *Mustela putorius*, or *Putorius fœtidus*, a quadruped of the weasel family (*mustelidæ*), and commonly referred to the same genus with the weasel, stoat, or ermine, etc. It is the largest British species of that genus, the length of the head and body being about a foot and a half, the length of the tail more than five inches, the form stouter than that of the weasel or of the ermine. Its color is a deep blackish brown; the head, tail, and feet almost black, the under parts yellowish, the ears edged with white, and a whitish space round the muzzle. The hair is of two kinds—a short woolly fur, which is pale yellow, or somewhat tawny; and long shining hairs of a rich black or brownish-black color, which are most numerous on the darkest parts. The nose is sharp, the ears short and round, the tail pretty equally covered with longish hair. There is a pouch or follicle under the tail, which exudes a yellowish, creamy substance of a very fetid odor; and this odor is particularly strong when the animal is irritated or alarmed. Hence, apparently, its name *foumart* (*foul marten*), which, with various provincial modifications, as *fulimart*, *thoumart*, etc., is prevalent in most parts of Britain. The origin of the names polecat and fitchet is much more uncertain.

The polecat was much more common in Britain in former times than now, and is almost extirpated from some districts, through the constant war waged against it by gamekeepers and others. It eats everything that the gamekeeper wishes to preserve. It is extremely destructive in the poultry-yard, the abundance present there inviting it to drink blood and eat brains, which seem to be its favorite luxuries. The rabbit is followed by the polecat into its burrow, and its ravages among poultry are partly compensated by its destruction of rats.—The taming of the polecat does not seem to have been attempted. The smell prevents it.—The skin is imported from the n. of Europe under the name of *fitch*, and is used as a kind of fur, similar but inferior to that of the marten (q.v.). It is imported to some extent from the n. of Europe. To artists, the hair of the *fitch* or *fitchet* is well known as that of which their best brushes are made; the hairs used for this purpose being the long hairs already noticed, which grow through the lighter-colored fur of the animal—The ferret (q.v.) is supposed by some to be a mere variety of the polecat.—A dark-colored kind of ferret is commonly regarded as a cross between the polecat and the ferret, and is sometimes called the *polecat-ferret*. The polecat breeds in May or June, making its nest in an old rabbit burrow or similar hole, and producing four, five, or six young.—In North America the skunk (q.v.) is called polecat.

POLEMONIA'CEÆ, a natural order of exogenous plants, allied to *convolvulaceæ*, and containing more than 100 known species, natives of temperate countries, and particularly abundant in the north-western parts of America. They are mostly herbaceous plants, with alternate and often pinnated leaves; regular hermaphrodite flowers; 5-cleft calyx; 5-lobed corolla; 5 stamens, springing from the tube of the corolla; the ovary free, surrounded with a fleshy disk; the style surmounted by a 3-cleft stigma; the fruit a capsule with 3 cells and 3 valves; the seeds often enveloped in mucus, which contains spiral threads. Some of the species are favorite garden flowers, as *polemonium cœruleum*, *codœa scandens*, and species of *phlox*, *ipomopsis*, *gilia*, etc. None are of value otherwise. *Polemonium cœruleum*, the only British species, and a rare plant in Britain, is well known in gardens by the curious name of *Jacob's ladder*. It is also called *Greek valerian*. It is not supposed to be really the *polemonium* of the ancients, to which great medical virtues were ascribed by them. It has a stem from one to two feet high, pinnate leaves, and a panicle of blue (or white) flowers.

POLEN'TA, a preparation of semolina (q.v.) or of Indian corn or maize meal, which is used as food by all classes in Italy. By the poorer classes, maize is universally used. The material is mixed with milk or water, and boiled until it is just thick enough to pour out into a dish, in which it becomes as firm as a thick jelly. Cheese is grated over it, and other condiments are added according to taste, and it is cut out in slices, and either eaten at once, or sometimes the slices are lightly fried in oil or butter. Semolina being much more expensive, is only used by the wealthier people, and many ingredients are added to suit their taste.

POLES (Gr. *polos*, a turning-point), in *geography*, are the two extremities of the axis round which the earth revolves; they are therefore situated the one on the n. and the other on the s. side of the equator, and equidistant from all parts of it, or in lat. 90° n. and lat. 90° south. They are called the north and south poles of the earth.—In *astronomy*, the poles, which, for distinction's sake, are frequently denominated "celestial poles," are those points in the heavens to which the earth's axis is directed, and round which the heavens seem to revolve. The celestial poles are valuable points of reference to astronomers and geographers, so that the determination of their position in the heavens is a matter of the utmost importance. Unfortunately no stars mark their exact situation (see POLE-STAR) though there is a minute telescopic star only a few seconds from the north pole, which may be employed instead of it in rough observations—and therefore it is necessary to adopt some means for discovering its precise position. This is effected in the following manner: A bright star (generally the pole-star) is selected, and its position

in its upper and its lower *culminations* (q.v.) is accurately noted; the point midway between these two positions of the star is the pole of the heavens. The observation of the star's two positions must be corrected for refraction, and it is for this reason that the pole-star is selected, since the effect of refraction is much the same in both positions of the star. The term "poles" has, however, a wider application, as denoting the extremities of a line passing through the center of a great circle perpendicular to its plane; thus, we have the poles of the horizon (viz., the zenith and nadir), the poles of the ecliptic, the poles of a meridian; and in the same sense, the terestrial and celestial poles are spoken of as the poles of the equator and equinoctial respectively.—Pole, in *geometry*, is used in a very indefinite sense; and in *physics*, it denotes those points of a body at which its attractive or repulsive energy is concentrated. See POLARITY and TERRESTRIAL MAGNETISM.

POLE-STAR, or POLARIS, the nearest conspicuous star to the north pole of the celestial equator. The star which at the present time goes under the name of the "pole-star" is the star α in the constellation of Ursa Minor. By examining attentively the general movement of the stars throughout a clear winter's night, we observe that they describe circles which are largest at the equator, and become smaller and smaller as we approach a certain point (the north pole of the celestial equator), close to which is the star above mentioned. This "pole-star" is, however, a little less than $1\frac{1}{2}°$ from the pole, and has a small but sensible motion round it. See POLES. Owing to the motion of the pole of the celestial equator round that of the ecliptic (see PRECESSION OF THE EQUINOXES), this star will in course of time (about 2100 A.D.) approach to within 28′ from the north pole, and will then recede from it. At the time of Hipparchus (156 B.C.), it was 12°, and in 1785, 2° 2′ from the north pole. Its place can easily be found in the heavens, for a line drawn between the stars α and β (called the two *pointers*, from this peculiarity) of the constellation Ursa Major or the Great Bear, and produced northwards for about $4\frac{1}{2}$ times its own length, will almost touch the pole-star. Two thousand years ago, the star β of Ursa Minor was the pole-star; and about 2,300 years before the Christian era, the star α in the constellation of the dragon was not more than 10′ from the north-pole; while 12,000 years after the present time, the bright star Vega in Lyra will be within 5° of it.

The south pole of the celestial equator is not similarly marked by the near neighborhood of a bright star, the only star deserving the name of the south pole-star being of the sixth or least visible magnitude.

POLIANTHES. See TUBEROSE.

POLICE (Fr. *police*, Gr. *politeia*, civil government; from *polis*, a city) are in England peace officers appointed in all parts of town and country for the purpose of watching property and detecting crime, and arresting offenders and maintaining public order. Though the word policeman is now, especially in towns, a household word, the legal denomination is that of constable; but he is a paid constable, to distinguish him from unpaid constables and special constables. In each parish in England the justices of the peace have power to appoint constables to act gratuitously and compulsorily; but the vestry has power to resolve that one or more paid constables shall be appointed, in which case the justices are to make the appointment, and these paid constables supersede the unpaid constables. The salary of these parish constables is paid out of the poor rates of the parish by the overseers. The justices also appoint a superintendent constable for each petty sessional division, to settle the fees and allowances which are to be paid to the constables for the service of summonses, and for the execution of warrants incidental to the office of justices of the peace. In all boroughs in England, the corporation is empowered, by the municipal corporation acts, to appoint a watch committee, who appoint a sufficient number of men to act as constables. The treasurer of the borough pays their salaries, wages, and allowances, as well as extraordinary expenses incurred by them. By an act of parliament applicable to counties, the justices are empowered to establish a sufficient police force for each county, and a chief constable is appointed to govern the whole.

The duties of the English police-officers are exceedingly multifarious, and they receive printed regulations to guide them in the proper discharge of such duties. They have important duties in reference to the apprehension of offenders, and their powers are necessarily larger than those of private individuals. Wherever a person is seen in the act of committing a felony, it is the duty of every one, not merely of constables, to apprehend him or her without any warrant, for no warrant is needed. Persons found offending in many misdemeanors may also be apprehended by anybody without a warrant; but in other cases, a constable only can make an arrest. In case of a riot, anybody may arrest the rioter. Constables are bound to arrest hawkers trading without a license; and vagrants who are offending against the vagrant acts, such as telling fortunes, loitering about premises, etc. The powers of constables are much greater than those of individuals with reference to crimes after they are committed. Thus, where the constable has not seen the offense committed, but is merely told of the fact, and he has reason to believe it, he is entitled to arrest the party charged without any warrant; he must, however, in such cases act only on reasonable suspicion. He is not justified, for example, in apprehending a person as a receiver of stolen goods on the mere assertion of the principal felon; nor is a constable justified in taking a person into custody for a mere assault without a warrant, unless he himself was present at the time the assault

was committed, or reasonably apprehends a renewal of it. If a constable have a reasonable suspicion that a man has committed a felony, he may apprehend him; and so a private individual may do so. The difference between the authority of the constable and the private person in this respect is, that the latter is justified only in case it turn out that a felony was in fact committed; but the constable may justify the arrest and detention whether a felony was committed or not. It is the duty of a constable to raise a hue and cry in search of a felon, and all private individuals are bound to join in it, otherwise they may be indicted and fined. An arrest by a constable is usually made by laying hands on the party, and detaining him; but it is enough for the constable to touch him and say: "I arrest you, in the Queen's name." If the party arrested be in a house in hiding, the constable may demand admittance, and if he is refused may then break open the doors; this is so in all cases where the party has committed treason or felony, or has dangerously wounded another. In cases where the constable is not authorized at common law or by some statute to arrest a party without a warrant, then he must produce a warrant signed by a justice of the peace, and show it to the party if it is demanded; and if the constable happens not to have the warrant in his pocket at the time, even though it is not asked for, it is an illegal arrest. When a party is arrested, it is the duty of the constable to take him without any unreasonable delay before a justice of the peace, and meanwhile lodge him in safe custody. The party arrested must not be treated with harshness beyond what is necessary for safe custody, and therefore it has been held that a constable has no right to handcuff a person whom he has apprehended on suspicion of felony, unless such person has attempted to escape, or it be necessary to prevent an escape. Nor has a constable in general a right to search a person apprehended, unless the latter conduct himself violently.

The conduct of constables in reference to public-houses is of some importance. It is an offense in publicans and beer-house keepers, and indeed the keepers of all places of public resort, to refuse to admit the constable into such house or place at any time. Thus, in the case of these places being open on Sundays at the times prohibited by statute, the constable, if he suspect that the act is being violated, may demand admittance, and thus satisfy himself as to the fact. It is owing also to this power of a constable to enter at all times, that he is enabled to detect other offenses in public-houses, such as harboring prostitutes and disorderly characters. Constables, when suspecting that a betting house is kept, must first get a warrant from a justice of the peace, which can be obtained without notice to the parties, and can then break into the house. So as to gaming-houses. While constables have summary power of entering public-houses, still this is not to be abused; and it is a distinct offense in the keepers of all public places where wine, spirits, beer, cider, or any fermented or distilled liquors are sold on the premises, to knowingly harbor, or entertain, or suffer to remain there such constables during the time they are on duty, except when quelling disturbances or restoring order. It is an offense punishable with more than usual severity to assault constables when in the execution of their duty. For the statistics of the London police see LONDON.

In the United States the system of municipal police is modeled after the English, the functions of these officers being limited to securing the person and property of law-abiding citizens. They are charged with the maintenance of public order, the suppression of crime, the investigation of offenses, the arrest of criminals, the collection of proof against them, etc. But the duties of maintaining the safety of the state, of regulating the operations of trade and commerce, and of looking after the public health—all of which devolve upon the police in many European countries, as in France, Germany, Austria, and Russia, are in this country delegated to other branches of the state and municipal government. While there are no general laws in the U. S. determining the duties and powers of the police, which even in their broad outlines are only a matter of state supervision, and in their details are regulated by local ordinances, nevertheless the system adopted throughout the country is essentially the same. A distinction is generally made between the rural police, which operates throughout the country districts, and the metropolitan police, which is constituted for large cities. Both these classes, indeed, have the same purposes, and are clothed with similar authority; but the duties of the latter are far more extensive and detailed. The police system of New York may be taken as an example of the system established in all the larger cities. It is managed by four commissioners appointed by the mayor for a term of six years. They appoint all members of the force, from the superintendent down, and have the power of dismissal for cause shown. The superintendent is the chief executive officer. Immediately under him are four inspectors, one of whom is required to be at Police Headquarters at night. For patrol service the city is divided into 34 precincts, each having its own station-house, with quarters for the men, cells for prisoners, and lodgings for homeless applicants. The force of a precinct consists of a capt., sergeants, roundsmen, and patrolmen. In the upper or suburban districts there are a number of mounted patrolmen. The duty of the roundsmen is to go the rounds and see that each patrolman is on his beat. All the police stations are connected by telegraphic wires with the central office, and the latter must at once be notified of any occurrence of special importance. The quota known as the 24th precinct are assigned to harbor duty, and their headquarters are on a steam tug-boat provided for their use. The detective service (see DETECTIVES) has its headquarters at the central office, and is under

command of an inspector. There are six police courts, for the summary trial of small offenses, of the preliminary hearing in graver cases. They are furnished with a squad of men, under command of a sergeant, who attend the courts, serving processes, etc.

POLICE, MILITARY, has two significations—1st, the organized body employed within an army to preserve civil order, as distinct from military discipline; and 2d, a civil police with a military organization. The police of an army commonly consists of steady intelligent soldiers, who act under the orders of the provost-marshal, and arrest all persons out of bounds, civilians not authorized to pass the lines, disorderly soldiers, etc.; they also attend to sanitary arrangements. As in all military matters, the police of an army possess summary powers, and a sentence of the provost-marshal is carried out immediately after it is pronounced.

Of civil police with military organization may be instanced, as specimens, the gendarmes (q.v.) of France, the Sbirri of Italy, and, in an eminent degree, the Irish constabulary.

POLICY (a corruption of the Lat. *polyptycha*, [analogous to *diptycha*, i.e., two-fold, or a pair of tablets] applied in the middle ages to memoranda or registers written on a set of several tablets), as a legal term, denotes the contract of insurance (Ital. *polizza d'assecurazione*). The usual contracts are for the insurance of life, or rather against the risk of death, against fire, against loss of a ship; but the same name is given to a similar instrument adapted to meet any other risk. See INSURANCE.

POLIGNAC, an ancient French family, which takes its name from a castle said to have been built in the 5th c., on a rock of the Cevennes, near Puy-en-Velay, in the department of Haute-Loire, on the site of a Roman temple dedicated to Apollo, whence—according to certain rather credulous genealogists—the castle was originally called *Apollianique*, of which Polignac is affirmed to be only a later corruption. The first of the Polignacs who acquired celebrity was MELCHIOR DE POLIGNAC, younger son of ARMAND, 16th MARQUIS DE POLIGNAC, and born at Puy-en-Velay, Oct. 11, 1661. Destined by his parents for an ecclesiastical career, he received an excellent education at Paris in the colleges of Clermont and Harcourt. In the negotiations of Cardinal de Bouillon with Pope Alexander VIII. at Rome in 1689, the young but astute and insinuating abbé took a principal part. In 1695 he was sent to Poland as French ambassador, when John Sobieski was dying, and diplomatized and intrigued so cunningly in favor of prince de Conti, that the latter was actually elected his successor. Events, however, frustrated this policy, and both Conti and Polignac had to leave Poland rather precipitately, in consequence of which the latter lost the royal favor. He now retired to his abbey at Bonport, where he spent the next four years, partly occupied in the composition of a Latin poem entitled *Anti-Lucrètius*, which was intended as a refutation of the skepticism of Bayle. It appears to be a very respectable and even able performance. In 1702—after a stroke of his usual neat flattery—he was recalled to Versailles, and rose higher into favor than ever. Named *auditeur de rote* in 1706, he was sent to Rome, where he devoted himself to the study of canon and civil law, was associated in the negotiations of Cardinal de la Trémouille, and honored with the friendship of Pope Clement XI. In 1712 he was appointed French plenipotentiary at the congress of Utrecht; and after his return, obtained the abbeys of Corbie and Anchin. When Louis XIV. died, Polignac was at the top of his reputation and influence. During the regency of the duke of Orleans, he took part in the conspiracy of Cellamare, and was banished to his abbey of Anchin. In 1720 he was sent to Rome, charged with the conduct of French affairs, and remained here for about ten years, and signalized his mission by healing the quarrel that was dividing the Gallican church on the subject of the famous bull *Unigenitus*. In 1726 he was raised, in his absence, to the archbishopric of Auch; and on his return to France, spent the remainder of his days in literary repose, and in the high esteem of courtiers, scholars, and the like. He died April 3, 1742. Polignac succeeded Bossuet at the Académie Française in 1704, and became an honorary member of the *académie les sciences* (1715) and of the *académie des belles-lettres* (1717). See C. Faucher's *Histoire du Cardinal de Polignac* (2 vols., Paris, 1772), St. Simon's *Memoires*, and D'Argenson's *Memoires*.

The other members of the Polignac family who have an historical name at all are more notorious than noteworthy. In the reign of Louis XVI., YOLANDE-MARTINE, GABRIELLE DE POLASTDRON, DUCHESSE DE POLIGNAC (born 1749; died at Vienna, Dec. 9, 1793), and her husband, JULES, DUC DE POLIGNAC (died at St. Petersburg, 1817), were among the worst, but unhappily most favored advisers of Marie Antoinette. They obtained vast sums of the public money from their royal master and mistress, and were largely, if not mainly responsible for the frightful pecuniary extravagance of the court. The discovery of the famous *libre rouge* occasioned the exulting cry of Mirabeau: *Mille écus à la famille d'Assas pour avoir sauvé l'état; un million à la famille Polignac pour l'avoir perdu!* The Polignacs—knowing the deep hatred felt toward them by the French people—were the first of the *noblesse* to emigrate (July 16, 1789). From the empress Catharine of Russia the duke received an estate in the Ukraine, and did not return to France at the restoration. He left three sons and a daughter, of whom only one has become historical—AUGUSTE JULES ARMAND MARIE, PRINCE DE POLIGNAC (born at Versailles, May 14, 1780). On the restoration, he returned to France; became intimate with the comte d'Artois, afterward Charles X.; showed an ardent attachment

to the church of Rome—or at least to its policy—and, in consequence, received from his holiness, in 1820, the title of prince; was appointed ambassador at the English court in 1823; and finally, in 1829, became head of the last Bourbon ministry, in which capacity he promulgated the fatal ordonnances that called France to arms, and drove Charles X. from the throne. He then attempted to flee from the country, but was captured at Granville on Aug. 15; was tried, and condemned to imprisonment for life in the castle of Ham, but was set at liberty by the amnesty of Nov. 29, 1836. He took up his residence in England, but died at Paris, Mar. 2, 1847.

POLISH LANGUAGE AND LITERATURE. The Polish language is one of the most widely-spread branches of the Slavic, forming (according to Dobrowsky), along with the Bohemian, the western branch. It surpasses almost all the other Slavonic tongues in euphony and flexibility, and is scarcely excelled by any language in point of brevity. It does not make use of the article, but has a most elaborate declensional system, comprising seven cases. The conjugation of the verb is equally elaborate, and enables a Pole to express transitions and delicate niceties in the conditions of time and gender quite unknown to the French, or German, or English verb. The Polish vocabulary is also uncommonly rich. The number of harsh consonants in the language, it must be admitted, is large, and this fact is a marked distinction between it and its eastern sister, the Russian; but in pronunciation, these are so much softened that its euphony is preserved. It alone of all the Slavic dialects, with exception of the old Slavic church language, has two nasal sounds: one like the French *on*, the other like the French *in*. The letter *l* has also a peculiarly broad snarling sound. After the introduction of Christianity, Latin, the language of the church, exercised a powerful influence on its structure and development, and subsequent to the 14th c. it adopted into its vocabulary numerous German words. In the 16th c., Polish, as a written language, rapidly attained so high a degree of perfection that it supplanted even Latin itself, until then the language of the state and of the learned. The best Polish grammars are those of Mrongovius (3d ed., Danz. 1837), Bandtke (Breslau, 1824), Muczkowski (Crac. 1845), and Booch-Arkossy (1866); the most comprehensive dictionary is that of Linde, after which rank those of Bandtke (2 vols., Breslau, 1806), Mrongovius (Königsb. 1835), Trojanski (4 vols., Posen, 1835–46), and Liebkind (1855).

The history of Polish literature is divisible into five clearly-marked periods. The *first* extends from a date antecedent to the introduction of Christianity down to the close of the 15th century. Of pre-Christian Polish literature, nothing has survived but some popular songs and proverbs. Among the very oldest literary monuments is a hymn to the virgin Mary, ascribed to St. Adalbert. The introduction of Christianity paved the way for a Latin literature more or less ecclesiastico-historical. Casimir III. (q.v.), surnamed the Great, did more than any other early Polish monarch for the encouragement of literature, and, among other things, founded the university of Cracow, which, from the beginning of the 15th c., long continued to be the center of intellectual life and culture in Poland. To the 15th c. belong Jan Dluglosz (Lat. *Longinus*) author of a most interesting and valuable *Historia Poloniæ*, in 13 books, and otherwise worthy of remembrance as an able diplomatist and philanthropist; also Jan Laski, archbishop of Gnesen (b. 1457, d. 1531), whose collection of the oldest Polish laws, *Commune Inclyti Poloniæ Regni Privilegium*, is of great historical importance. In 1490 the first printing-press in Poland was established at Cracow.

The *second* period of Polish literature embraces the 16th and first quarter of the 17th c., and is marked by the use of the Polish as a written language. The reigns of Sigismund I. and Sigismund II. Augustus are regarded as the golden era of Polish literature, properly so called. The series of poets begins with Nikol. Rej (b. 1515, d. 1568), commonly called the *father of Polish poetry*, a native of Zoravno, in "Little Russia," and educated at Lemberg and Cracow. He spent his life at the court of the Sigismunds. His principal works, *Wizerunek Zywota Czlowieka Poczciwego* (Crac. 1560) and *Apophthegmata* (Crac. 1568), are full of sharp wit and strong satire, and though the language is rough and unpolished, it is genuinely poetical. After Rej, the brothers Jan and Piotr Kochanowski hold the highest rank. Szymonowicz or Simonides (d. 1629) acquired by his Latin odes the name of the "Latin Pindar;" and his *Sielanki* ("Idyls," new ed., Leip. 1837), modeled on those of Theocritus, exhibit a charming simplicity of style. Still more original, if scarcely so graceful, are the *Sielanki* (new ed., Leip. 1836) of his friend Zimorowicz (d. 1629). Sebastian Klonowicz, called *Acernus* (d. 1608), is celebrated as a satirist and descriptive poet. The reformation, which rapidly made way in Poland, being tacitly approved of by the rulers and magnates, gave a powerful stimulus to the intellectual and spiritual activity of the nation—visible in translations of the Bible, hymn-books, and an important pulpit or sermon literature. Among the historians of this period, the most celebrated are the brothers Bielski; Lukas Górnicki (d. 1591), author of a history of the Polish crown (*Dzieje w Koronie Polskiéj*, Crac. 1637, Wars. 1804); Strzikowski (d. 1582), whose *Chronicle of Lithuania* (Königsb. 1582) is an admirable work; and Paprocki (d. 1614).

The *third* period of Polish literature, extending from 1620 to 1750, is coincident with the rule of the Jesuits, who first obtained a footing in Poland about 1566, through the influence of cardinal Hosius, soon possessed themselves of the schools, and, on the whole,

seriously checked the literary and religious growth of the nation. The most conspicuous poet of this retrogressive period is the Jesuit Kazimierz Sarbievski (1595–1640), who wrote only in Latin; others more or less noteworthy are Kochowski (d. about 1700); Tvardovski (d. about 1660); Opalinski (d. 1655); Chros'cinski, the translator of Lucan; Morsztyn, the translator of Corneille; and Elz'sbieta Druz'backa (d. 1760). Among the historians of this period, it may suffice to mention Starovolski (d. 1656), author of *Polonia, sive Status Regni Poloniæ Descriptio* (Wölfenbuttel, 1656), and other works; Kojalowicz, a Jesuit (d. 1677), and Kaspar Niesiecki, a Jesuit (d. 1745), whose *Korona Polska* (4 vols., Lemb. 1728–43) is the most important work on Polish heraldry.

The *fourth* period, commencing with the middle of the 18th c., and extending into the first quarter of the 19th, owes its characteristics partly to the influence of the French literature of Louis XIV.'s time; partly also to the liberal patronage of literature and science by king Stanislas Augustus, the princes Czartoryski, Jablonovski, and other magnates, and the educational reforms of Stanislas Konarski (b. 1700, d. 1773). The good work begun by Konarski was carried on by Kopczyn'ski (1735–1817), who was the first to thoroughly establish on a scientific basis the grammar of the Polish language in his *Grammatyka Norodova;* by Piramowicz (d. 1801); by Bohomolec, the Jesuit, who translated a multitude of stage-pieces from the French; but above all, by Adam Stanislas Naruszewicz, the accomplished translator of Tacitus; and Ignacy Krasicki (1735–1801), called the "Polish Voltaire," the center of the whole Polish literature of his age, whose satires and fables are reckoned the first in his native language. As poets of this renaissance period, occur the names of Trembecki, Cajetan Wegierski, Godebski, and Wezik. The most noted dramatist is Boguslavski (d. 1829), who wrote about 80 plays—the majority of which, under the title of *Dziela Dramatzezne*, were published at Warsaw (9 vols., 1820).

The political storms that swept over Europe at the close of the 18th and the first years of the 19th c., did not quite destroy the new literary life that had burst into blossom under Stanislas Augustus. In 1801 the historian Tadeusz Czacki, Franciszek Dmochowski, and bishop Jan Albertrandy founded at Warsaw the "society of the friends of knowledge," which, especially under the auspices of the state-councilor Staszyc, bore good fruit till it was dissolved in 1832, when its library of 50,000 vols. was carried off to St. Petersburg. At the same time, Jozel Maximilian Ossolinski, Hugo Kolontaj, and Stanislas Potocki, by word and writing exercised a mighty influence on the renovation of the national spirit, The transition to this *newest* or *fifth* period was made by Karpinski (1745–1825), whose songs and idyls (4 vols., Warsaw, 1804; new ed., Leip. 1836) live on the lips of the Polish people; by chancellor Voronicz (1757–1829), a richly imaginative poet, and a great orator; by Niemcewicz (1757–1841), a statesman, soldier, and author of celebrity in his own land; and by the poet Kasimierz Brodzinski (1791–1835). At Wilna, which, after 1815, became the center of Polish literary activity, and a rallying-point for all the enthusiastic spirits of the land, several young men united, with Adam Mickiewicz (b. 1798) at their head, in a crusade against the still dominant French style of literature. We can only name some of his numerous and brilliant associates, as Malczevski (1792–1826), whose best production is his epic-lyric narrative of Ukraine life, entitled *Marja;* Goszczynski (b. 1806; poems, 3d ed., Breslau, 1852); Bohdan Zaleski (b. 1802); *Poezye*, Pos. 1841, and later); Tomasz Padura (*Pienia*, Lemb. 1842); Odyniec (*Poezye*, Pos. 1833); Korsak (*Poezye*, Pos. 1833); Chodzko (*Poezye*, Petersb. 1829); Groza (*Poezye*, Wilna, 1836); Lucyan Siemienski (b. 1809), an excellent novelist and translator; Bielovski (b. 1806), a lyric poet and translator; Gorecki, renowned for his pungently sarcastic fables (*Bajki i Poezj nove*, appeared at Paris in 1833); Garczynski (*Poezye*, Paris, 1833); and Slowacki, the most fertile of all the recent Polish poets. Most of these writers became either "banished men," or men who, while living, were forced to expatriate themselves. They belonged to the "Polish emigration," whose headquarters was Paris. The most many-sided and prolific of all the modern Polish novelists is Jozef Ignacy Kraszevski, who was born at Warsaw in 1812. The new national tendency of Polish literature, which naturally first showed itself in poetry, soon became visible in other departments also. Thus, Joachim Lelewel (b. 1786) rose to the first rank as a writer of Polish history, and a study of his works is absolutely indispensable to a knowledge of that subject; next to him (and later) in the same department stand Bandtke, Maciejovski, count Raczynski, and count Plater. Narbutt of Wilna wrote a very solid and comprehensive work on Lithuanian history (Wilna, 1837 *et seq.*), and Lukaszewicz of Posen has furnished numerous important contributions to the history of the reformation in Poland. A multitude of works more or less weighty have been devoted to a record of the revolution of 1830, chiefly, of course, by Polish emigrants. In philosophy, theology, and physical sciences Poland has nothing of consequence to show.—The principal works on Polish literature are those of Muczkovski, Bentkovski, Ossolinski, Chodynicki, Lukaszewicz (Posen, 1860) and the comprehensive history by Visznievski. See also Nitschmann, and works by Morfill.

POLISHING MATERIALS. See Diamond; Emery; Pastes; and Putty Powder.

POLISHING OF METALS. This is effected by first removing any tarnish or oxidation by means of some material which will chemically act upon it; for this purpose sulphuric,

hydrochloric, oxalic, and acetic acids are used to different metals, and in various states of dilution. Usually it is necessary to remove the acid with clean water and dry rapidly, to prevent re-oxidation; and then either friction with various polishing materials, or rubbing with a smooth hard surface or burnisher, brings out the luster of the metal.

POLITIANUS, Angelus. See Poliziano.

POLITICAL ECONOMY, is the science of wealth. The word economy is derived from the Greek word for house-law or house-regulation. It refers to the material portion of domestic regulations, the most important part of which is the adjustment of the expenditure of the household to the income at its command. The addition of the word political, was the result of the view that a nation could be regulated just as a house is regulated, by adjusting the spending and the getting of the national wealth. When the term "political economy" was first employed it was hardly to be distinguished from finance or political arithmetic, and implied no conception of the study as a science but merely as the art of directing the national policy on its financial side. Political economy now means not the art of regulating communities in this respect, but the science of those laws which underlie their economic activity. Its definition as the science of wealth or as the body of knowledge which relates to the production, distribution and exchange of wealth, is sufficiently exact for the purposes of this article, but a whole treatise could be written at the outset, on the different views which writers have held as to the true scope of the science. Inasmuch as the term political seems to confine the scope of the study too much to a consideration of state or national policy, the name economics is now often employed for the science.

The history of political economy requires a knowledge not only of the various economic theories held at successive periods, but of the social and industrial conditions which led to the formation of those theories. An economic dogma is only relatively true. Its value must be judged from the point of view of the period and of the nation to which it applies. Scattered through the writings of the ancients are statements of an economic nature in regard to the meaning of wealth, money, and other terms employed in the science, but nowhere is there to be found a consistent body of scientific propositions on the subject. Greek speculation busied itself with economic concepts just as it did with every other department of thought. Aristotle, for instance discusses, the acquisition of wealth and the distinction between money and wealth, in the latter respect approaching nearer to the truth than many of the writers of the 18th century. Mediæval literature is singularly barren of economic thought, and the Schoolmen rarely advanced any proposition that was likely to have a permanent application, although Aquinas shows the influence of Aristotle in his speculations, and advances theories which prove him to have been in advance of most writers of his time. To see how inapplicable modern economic doctrines are to ancient or mediæval conditions, it is only necessary to consider the great differences between their industrial condition and ours. For instance, it would be absurd to apply our reasoning in regard to the wages system to a state of society in which almost all productive labor was in the hands of slaves or serfs; or to quarrel with the mediæval view that interest-taking was a sin, when capital in our modern sense can hardly be said to have existed at all. This matter of interest affords an especially good illustration of the differences between mediæval and modern conditions and the consequent differences in the economic principles set forth by mediæval and modern writers respectively. The mediæval view was based on the prevailing idea of primitive Christianity that material welfare was not a worthy aim for mankind. The teachings of the church encouraged asceticism and the employment of wealth not for personal gain, that is not as capital, but for the benefit of others, "Lend and ask for nothing again" was the ethical principle which should govern the action of the lender. This was but natural, since the chief purpose for which money was borrowed at a time when its productive employment was not general was for immediate consumption. The borrower needed money for his subsistence and if the lender asked for more than the principal he was committing the sin of usury.

With the rise of the national state different ideas of the nature of capital, and the justice of interest-taking arose. Governments finding wealth the basis of their strength took every means to increase it by regulation of commerce, encouragement of exports and efforts to secure the advantage in colonization and discovery. With the development of this gain-seeking national policy there arose a body of doctrines which were supposed to point out the best way to increase the national wealth. The writers on this subject are classed as the Mercantilist school, but the term is misleading as it seems to imply a common belief in a specific economic philosophy, while the Mercantilists were merely a body of writers who, in the light of the experience of their own times, propounded such theories as they thought would promote the prosperity of their country. They made no attempt to investigate the laws governing production, distribution and exchange of wealth, but merely sought to ascertain by what means the wealth of a nation could be increased, and here many of them took a very limited view of the term wealth, restricting it to money or the precious metals. The great object of international policy was to secure what they termed a favorable balance of trade, that is, an excess of the precious metals. In any international bargain it seemed to be their view that one nation's gain was another's loss, such loss or gain being measured by the excess or deficiency of the precious metals. For this reason they resorted to every expedient to secure for their own nation that excess, and as a result we see those restrictions on trade which marked the financial policy of nations in the 17th and 18th

centuries. Bounties were granted to exports because exports brought specie into the country; prohibitory duties were levied upon imports because imports drained the country of its precious metals. The colonies were regarded merely as feeders of raw material to the mother country. They were subjected to navigation laws which restricted their foreign and carrying trade, while at the same time a sharp eye was kept on their industries lest there might spring up in the colonies manufactures likely to rival those in the home country. Artificial restraint, then, was the main characteristic of the 18th century economic policy. Among the writers of the mercantilistic school may be mentioned Thomas Mun, Sir Josiah Child, Sir Wm. Petty and Sir James Steuart.

The reaction against these narrow views arose early in the 18th century and found its ablest exponents in France. The new school, called the Physiocrats, or *Économistes*, were the champions of a system of natural liberty, the term Physiocrat indicating by its derivation the rule of nature. Their view was that all individuals composing society have the same natural right. Government is a necessary evil, but in every way possible it should remove artificial restraint on the individual, and allow each member of society to seek his own advantage undisturbed. A still more characteristic feature of the Physiocratic school was their doctrine of the *produit net*, meaning by this the excess in value of the whole mass of agricultural products during a given time, over the cost of their production. This excess, according to their views, measured the increase in wealth. Only such labor as added to the quantity of raw material which was of service to man was considered by the Physiocrats as productive. For this reason they held that commerce was in no sense productive of wealth, considering it merely an exchange of equal value for equal value. They did not oppose commerce in fact they even proposed the removal of the restraints upon it; but, though useful, commerce was from an economic point of view sterile. The term sterility they applied not only to commerce but to manufactures which did not add anything to the stock of raw materials. It is this school which invented the phrase, *laissez-faire* or *laissez-passer* in advocating the let-alone policy of the government. Among its leading members were Quesnay, Turgot, Gournay, Mirabeau and others.

Many of the notions which were formerly credited to Adam Smith originated with the Physiocrats, but Adam Smith developed them and set them forth in so clear and systematic a form as to add greatly to their force. Smith made the Physiocratic doctrines bear fruit in governmental policy. He revolutionized the economic thought of England and entirely altered the attitude of the government toward economic matters. He was free from many of the faults of the Physiocratic school, especially from their erroneous doctrine of the *produit net*, and he showed the fallacy of regarding manufactures as a sterile form of activity. Smith has been called the father of economics, and formerly many spoke of him as if the whole science had sprung from his brain complete, like Minerva from the head of Jupiter, full grown and fully armed, but his proper place in the history of the science is that of the clearest and most systematic expounder of many theories previously held by others, and of some important principles never before enounced.

For many years economists followed in the lines laid out by Smith, improving on his statement of economic laws in many respects, but not advancing much that was new. Among the writers that may be classed as his followers are Ricardo, Malthus, J. S. Mill, McCullough, and J. B. Say. These writers and their followers have been called the Orthodox or Classical school. The general characteristic of their system of political economy was a belief in the efficacy of unrestricted competition as a factor in economic advancement. They followed the deductive method in scientific investigation, assuming certain premises based on the nature of man, and then drawing what they considered to be inevitable conclusions in regard to man's economic activity. They deprecated any kind of state interference, holding that artificial restraint tended to retard advancement, which they maintained was most rapid when labor and capital were left free to move in their most productive channels. The result of this view was the building up of a very systematic and consistent body of knowledge, which, however, failed to apply to many facts of common observation. Little regard was shown for difference in race and in social conditions, in following out this method. At the same time it supplied a good logical basis for the science, and showed what the tendency would be under given conditions. In classing John Stuart Mill with this school of economists, we should not forget that he anticipated in some points the views of more recent writers, and in his later years came to doubt the universal validity of some of the general laws he had set forth. For instance, in the matter of the wages fund (see WAGES), he publicly recanted the view expressed in the earlier edition of his political economy; nor did he continue a strict believer in the principle of *laissez-faire* in all respects. Still there is no doubt that the Classical school went too far in the direction above indicated, and it was natural that a reaction should take place.

The reaction against this too dogmatic treatment of political economy appeared first in Germany, and the modern Historical School may be said to owe its origin to the writings of Roscher and Knies. They have had many followers in recent years, both in Great Britain and in the United States. While recognizing the value of the deductive method within certain limits, the Historical School is distinctively inductive, basing its views on the observation of actual economic phenomena. Since economic laws are relative, not absolute, and do not apply with equal exactness to different nations and different periods, some writers of this school of political economy prefer to give the name National Economy to their science. This, however, has not come into

general use. One very marked point of difference between these later writers and the earlier school is their disbelief in the theory of *laissez faire*. They have greatly extended their views of the legitimate scope of governmental action, holding the right and obligation of the state to intervene on behalf of one or the other party in the struggle for existence. They favor the enactment of Factory Acts (q. v.), labor laws, etc., and many of them go so far as to advocate the assumption by the state of many functions formerly believed to be wholly within the province of private enterprise. On account of their views in the last mentioned matter, some of the more extreme writers have been termed Socialists of the chair or Katheder Socialists in Germany by those who view any departure from the let-alone policy as an indication of socialism. The most successful thinkers of to-day are those who employ both the inductive and deductive methods of investigation, checking the general conclusion reached by the former, by the observation of actual facts. Among the most eminent writers in this later period may be mentioned Wagner and Schmoller in Germany, Cotta in Italy, Wolowski, Leroy-Beaulieu, Levasseur, and Gide in France, Jevons and Marshall in England, F. A. Walker, J. B. Clark, A. T. Hadley, Mayo-Smith, etc., in the United States.

Recent economic treatises show a marked difference in some respects from the older works. The old system of dividing political economy into departments of production, exchange, distribution, and consumption, and separating these departments from each other by strict lines, is being abandoned. The present view is that such a division is misleading as tending to disguise the fact that the so-called departments are closely inter-related, that the phenomena of exchange have an important effect upon, or connection with, phenomena of production, that the laws of value cannot be discussed apart from the laws of distribution; in fine, that the facts discussed under the head of one department seem to belong as much to any of the others. A still more distinctive feature of the new works on political economy is the view of value, which is discussed in its origin as well as in its objective form. Modern economists are dissatisfied with the conception of value merely as "power in exchange," and some very useful work has been done in clarifying the subject by the American writer J. B. Clark, and by the Austrian school, represented by Böhm-Bawerk, Von Wieser, and others. They find the cause of value in Utility, meaning by the latter term not absolute utility in the sense of the general benefit an article confers on society, but effective utility, which is measured by the sacrifice which it is necessary to make in order to obtain a specific article. For further explanation of current views on this subject see the article VALUE. Another point on which modern writers have taken issue with the old school is in the doctrine of the wages fund, the prevailing opinion at the present time being that wages are not limited by a fixed portion of existing capital which is set apart for the payment of the laborer, but that the share of the wage earner comes to a certain extent out of product and is thus in some degree proportionate to his own exertions. (See WAGES.) In regard to pure profits—that share in the product of industry which in the older treatises was classed as "wages of management"—many writers at the present time hold that the law of economic rent applies to the earnings of the employer. A man with business ability realizes a profit from his industrial activity without necessarily raising the price of his goods or cutting down the wages of his employees. Finding the prices fixed in the market by the law of supply and demand, and himself subjected to the necessity of paying the same rate of wages as his commercial rivals, he is nevertheless, through superior ability or the possession of some industrial advantage, able to secure for himself a larger return than his less successful competitors. This larger return is a differential gain arising from greater ability or business advantages, in the same way that the rent of a certain piece of land is the differential gain arising from its superior fertility or better situation, when compared with the land at the margin of cultivation. See RENT.

Increasing importance is attached to those matters which were discussed in former treatises under the head of consumption. It is shown that consumption is the great force which directs the distribution of wealth, and produces many of the phenomena of value. Increased consumption is attended with diminished satisfaction. But for the operation of this law there would be no limit to the effect of a reduction in price on stimulating demand, but it is evident that when the available quantity of an article reaches the point at which wants are satisfied, a further reduction in its price cannot increase the demand for it. It is also evident that this point is reached in the case of some commodities more quickly than in the case of others. Food products, for instance, are said to be *insensitive*, that is, a fall in their price is not always accompanied by a proportionate increase in their consumption. On the other hand, there is a tendency for articles, the consumption of which is a matter of comfort or luxury, to be consumed even to more than the proportional extent as the price diminishes. These principles are borne out by the investigations of the noted statistician Dr. Engel, who has developed the fact that as the wages paid to a given group of laborers increase, the percentage of those wages which is spent for food diminishes. It is the aim of modern economists to trace the effect of this law on the prices of different commodities, and to show the relation between the principles which govern the satisfaction of human wants and the actual phenomena of value. As demand depends upon utility, and as utility varies with every article and at every point in the satisfaction of wants, the problem of consumption becomes very complex and involves an analysis of psychological motives. For this reason much of the recent economic speculation is less easy to comprehend than the writings of the older economists. Besides the references given in the text, see the articles BOUNTY, COLONY, COMMERCE, COMMUNISM, COMPETITION, CORN LAWS, DEMAND AND SUPPLY, EXCHANGE, FREE TRADE, LABOR, MONEY, MONOPOLY, NAVIGATION

Laws, Socialism, Wages, etc. Also: Agriculture, Factories, Factory Acts, Machinery, Political Economy of, Tariff, etc.

POLITICAL OFFENSES, crimes considered injurious to the safety of the state, or such crimes as involve a violation of the allegiance due by a subject to the supreme authority of the state. They have in general been more leniently dealt with under constitutional than under despotic governments. It is, however, a principle which has been generally recognized by the most constitutional of governments, that when the legislature thinks itself endangered by a secret conspiracy against the state, or an understanding with the enemies of the country, it permits the executive, for a limited time, to arrest suspected citizens, without the formalities which are required in ordinary circumstances.

POLITICAL PARTIES, AMERICAN. See Democratic Party; Republican; Party Names; United States.

POLITICAL PARTIES, AUSTRIAN. The Reichsrath, or Council of the Empire, is the central legislative body of Austria, or Cisleithania. It consists of an upper house (Herrenhaus) and a lower house (Abgeordnetenhaus). The Reichsrath, like the legislative body of Hungary, or Transleithania, has its own ministers and government, and exercises full parliamentary functions on all matters within its competence, from which, however, foreign affairs and war are excluded. These latter questions are dealt with by a supreme body known as the Delegations, composed of 60 members representing the legislative body of Austria, the upper house returning 20 and the lower house 40 delegates, and of an equal number, similarly chosen, representing the legislative body of Hungary. But political treaties concluded by the emperor are not valid without the consent of the Reichsrath.

The upper house of the Austrian Reichsrath contains 245 members. It is composed of the princes of the imperial family who are of age, of whom there are 21; of 68 hereditary nobles, of 17 archbishops and bishops, and of 139 members nominated by the emperor for distinguished services in science or art, or to the church or state. The lower house contains 353 members, who are the popular representatives of the seventeen provinces which comprise the Austrian empire. Bohemia has the largest number of members in the Reichsrath, its contribution being 92; Galicia comes next, with 63; and then follow in order, Lower Austria (including Vienna), 37; Moravia, 36; Styria, 23; the Tyrol, 18; Upper Austria, 17; Silesia and Carniola, 10 each; Bukowina, Dalmatia, and Carinthia, 9 each; Salzburg, 5; Trieste, Gorizia, and Istria, 4 each; and finally the Voralberg with 3. Each of these provincial divisions, however, has its own separate diet, consisting of one chamber only, for dealing with purely local matters. The conflict of parties may be said to attain its highest pitch in the lower house of the Reichsrath, which naturally includes members of widely varying race and creed. The most numerous element is the German, led by Dr. von Plener, sitting on the left, with a few Ruthenians and Italians. On the right sit the Czechs, led by Dr. Rieger; the Poles, led by Ritter von Jaworski, the Clericals, and the Feudals. The Centre is a small group, led by Count Coronini. It has been explained that, owing to the conflict of German and Slav races, legislation was only possible by means of combinations. This led to Count Taafe's administration being called "The Ministry of Patient Negotiation." The name was further justified in '90 by Count Taafe's success in bringing about a *modus vivendi* between the Germans and the Old Czechs. In broad outline the compromise provides that in the local administration the power shall rest with the majority, whether German or Czech. In the diet are to be three curiæ, representing the territorial nobility, the Germans, and the Bohemians, or Czechs. Each curia will have a right of veto in matters concerning the interests of a nationality. This compromise, however, has only given more prominence to a party called the Young Czechs, who demand complete national emancipation, and the coronation of the Emperor at Prague, as Emperor of Bohemia.

POLITICAL PARTIES, BELGIAN. The chief parties are two—viz., the Clericals and the Liberals—and there are, in addition, the minor groups of Protestants and Socialists. Neither of the two last named, however, wields an independent parliamentary influence, and both in the ordinary affairs of political life are anti-Catholic, and consequently vote with the Liberals. The Catholics, or "Clericals," as they are usually called, have now been in power for rather more than four years, the present ministry, under M. Beernaert, having, in Oct., '84, succeeded the Liberal administration of M. Frère-Orban, which had held office since June, '78. At the present time (1893) the Catholics are in a considerable majority, commanding 97 votes in the chamber against 41 of the opposition. The electoral practice is for one-half the chamber to retire every two years. The senate, is composed of 69 members. In April, 1893, a popular outbreak forced the legislature to concede what is practically universal suffrage.

POLITICAL PARTIES, BULGARIAN. The party divisions in the Bulgarian Sobranye, or National Assembly, may be generally described as Ministerialists and Opposition. The chief members of the governmental party, which is also the anti-Russian party, are M. Stambouloff, premier and minister of the interior; Dr. Stransky, minister of foreign affairs; M. Salobatcheff, minister of finance; M. Toutcheff, minister of justice, and Col. Motkoroff, minister of war. The chief opposition leaders are MM. Karaveloff and Radoslavoff.

POLITICAL PARTIES, CANADIAN. The Dominion of Canada (q.v.) is governed by a Senate and a House of Commons, with a Governor-General appointed by the Crown. Senators are nominated for life by summons of the Governor-General under the great seal of Canada. There are 80 senators. Members of the House of Commons are eleceted by constituencies, with a uniform franchise for the whole Dominion, except the Northwest territories, where manhood suffrage prevails. Elsewhere a small property qualification is imposed by law.

The two great political parties of Canada are the Conservatives and the Liberals. The former, led by the Rt. Hon. Sir John Thompson, Sir Hector Langevin (q.v.), Sir Adolphe Caron, Mr. Chapleau, Mr. George E. Foster, and Sir Charles H. Tupper, is in spirit and tradition the same as the Conservative party in England. It regards itself as the "loyal" party, desires a close connection with the British crown, favors a protective tariff, deprecates a commercial alliance with the United States, and proclaims as potential traitors those of the opposite faction who insist that a policy of commercial reciprocity with this country is demanded for Canada's best interests.

The Liberal party, headed by Sir Richard Cartwright, is less ostensibly devoted to British interests, but favors a policy of closer intercourse with the United States. The "radical" wing of this party even look with composure upon a political union, but do not regard "annexation" as a practical question as yet. Members of this wing of the Liberal party are popularly known as the "Grits."

Besides the political opposition of the Conservatives and Liberals, much friction is introduced into Canadian politics by the race question. There is an "English party" and a "French party," the latter being strong in the province of Quebec.

POLITICAL PARTIES, DANISH. In Denmark parties are broadly divided into supporters and opponents of a parliamentary system like that of England. The legislative assembly is called the Rigsdag, and has two houses—the Landsthing and the Folkething. There is no hereditary membership in either house. The Landsthing has 66 members, of whom 12 are life-members named by the king, and 54 are chosen by a system of indirect election. The king's nominees must have been members of the Rigsdag. The members of the Folkething are elected by universal suffrage, and members of both houses receive a payment of $2 a day when the Rigsdag is sitting, and their travelling expenses. There is a perpetual contest between the two houses. The ministry, under Herr Estrup, and their followers, the Conservatives, or Right, contend that by the constitutional law of Denmark (promulgated in 1849 and revised in '66) the Folkething has not, like the English House of Commons, the supremacy in matters of taxation and finance, and the power of practically deciding who shall be the ministers. They maintain that the king and Landsthing together may overrule the Folkething. The Left are those attached to the English system. Hence an apparently interminable dispute, in which the decided majority of the Landsthing are on one side, and an equally large majority of the Folkething (in proportion to its numbers) on the other. The majority of the popular house used to be called "the United Left," but they are no longer united. Herr Berg, who was formerly both leader of party and speaker of the Folkething, absolutely refused to recognize the king's ministers, whom he considered to be governing against the will of the country. The king, on the other hand, would not dismiss his ministers. Hence there was an absolute deadlock. Some 60 or 65 members, in consequence, abandoned Berg's leadership, and he was left with a following of little more than a dozen members. The others chose Count Holstein-Ledreborg as a leader. He since resigned, and in Oct., '90, no successor to him had yet been appointed. There were elections for both houses in 1890.

The elected members of the Landsthing sit for eight years, but one-half of the house is elected every four years. In this last election there was only notable change, which, however, did not affect the position of parties. Two socialists for the first time obtained seats. They were elected by Copenhagen districts.

POLITICAL PARTIES, ENGLISH. There are four great political parties at present represented in the British Parliament,—the Conservatives, the Liberal Unionists, the Liberals, or Gladstonians, and the Irish, or Home Rule party.

The Conservatives are identical with the Tory party of former times, and are led by the Marquis of Salisbury (q.v.) in the House of Lords, and by Mr. William Henry Smith (q.v.) in the House of Commons. Their professed policy is the maintenance of the Empire at all hazards, the preservation of the constitution in its present form, the continued union of Church and State, and a careful conservation of the rights of property. The Liberal Unionist party dates only from 1886, and represents a secession from the Liberal party on the occasion of Mr. Gladstone's advocacy of a measure of home rule for Ireland. This party is led by Mr. Joseph Chamberlain (q.v.), Mr. George Goschen (q.v.), and the Marquis of Hartington (q.v.). Its members at present act with the Conservatives on all leading questions, in order to prevent the accession to power of Mr. Gladstone and a government pledged to home rule. The Liberals inherit the traditions of the old Whig party, though the policy developed by them of late years is far more radical than the true Whigs ever professed. Their accepted leader is Lord Rosebery (q.v.), while the radical element is more fitly represented by Sir William Vernon-Harcourt and by Mr. Henry Labouchere (q.v.). The policy of the Liberals is one of abstention

from foreign complications, economy in expenditure, and reform in the constitution. The radical wing (known popularly as Jacobins) undoubtedly desire the disestablishment of the state church, manhood suffrage, free education, and the abolition of the House of Lords, and perhaps ultimately of the monarchy. The Irish, or Home Rule party, until lately known as Parnellites, but now divided between the leadership of Mr. John Redmond and Mr. Justin McCarthy (q.v.), have but a single programme,—the establishment of an Irish parliament and home rule for Ireland. To this they make all other questions subordinate. At present the Home Rule party acts with the Gladstonians, but has been always ready to transfer its votes to the Conservatives provided they will outbid their opponents for Irish support. See HOME RULE; PARLIAMENT; PLAN OF CAMPAIGN; GREAT BRITAIN; IRELAND—LAND LEAGUE.

POLITICAL PARTIES, FRENCH. Political parties in France may be roughly divided into two camps—Republicans and Reactionaries. There are, however, both inside and outside the Chamber of Deputies, several groups in each of these two divisions. The common principle which unites the Reactionaries in the Chamber is opposition to the republic; and they sit together to form the Right or Opposition, although representing at least two distinct parties—viz., Bonapartists and Monarchists.

The system of election in France is that known as *scrutin d'arrondissement*, which, by a vote of the Chamber passed in the early part of 1889, was substituted for *scrutin de liste*, the latter system, however, having only obtained since June, 1885. The avowed object of recurring to *scrutin d'arrondissement* was to combat General Boulanger, who, it was feared, intended to take advantage of the existing system to force a plébiscite from the country by offering himself as a candidate in every department. In order completely to defeat this scheme, the government introduced a further measure abolishing multiple candidatures, which was also passed. The result of this alteration of the electoral system was to reduce the number of deputies from 584 to 576. Of these 16 are returned by Algeria and the distant colonial possessions. To secure election it is indispensable that at least a fourth of the electors on the register record their votes; and return is further conditional on obtaining an absolute majority of the votes recorded. The principle of election is by universal suffrage. The Chamber of Deputies is elected for a period of fours year and the senate or upper chamber, apart from life-members, for nine years, one-third retiring every three years.

The Republicans may be subdivided into Opportunists, Left Centre, or Moderate Republicans, and Radicals. The Opportunists represent the most numerous and influential section of republicanism, and one that was formerly led by Gambetta (q.v.). The most prominent members since his death have been M. Ferry, Eugène Spuller (minister for foreign affairs in 1891), and M. Ranc. The newspaper organs of this section are the *République Française* and *Le Temps*. The Moderates are few in number, but strong in the ability and experience of its leaders, as well as in the wealth and social standing of its members. This section looks back to M. Thiers as its political model, and accepts his dictum, "La République sera conservatrice ou elle ne sera pas," as its political motto. Its policy is to oppose all that savors of the traditions of the revolution of 1793. The leaders of this party are M. Léon Say and M. Ribot. The Radicals, headed by MM. Clémenceau, Floquet, De Freycinet, Brisson, Goblet, and Milleraud, are also known as the Extreme Left. They do not represent any true political unity, but comprise men of all shades of advanced opinion, socialistic, communistic, anarchistic, and Boulangist. Of this group, though not leaders, are Joffrin and the Marquis de Moustiers.

The Monarchists are to be subdivided into Royalists and Bonapartists or Imperialists. The Royalists are the adherents of the Comte de Paris, whom they regard as lawfully king of France. This party has its chief strength in the north of France, in Normandy and Brittany, and desires to establish in place of the republic a constitutional monarchy. It has in the main the support of the priesthood. The organ of this party is the *Figaro*. The Bonapartists at present profess to acquiesce in the republic so long as it embodies the expression of the popular will; but aim more or less openly at what they designate a "Consular Republic," based upon the *plébiscite*—in reality a democratic despotism leading to the re-establishment of the Napoleonic empire. Of this party, M. Paul de Cassagnac and M. Jolibois are the principal leaders, and the would-be head of the "Consular Republic," is Prince Victor Bonaparte, son of the late Jerome Napoleon who died in March, 1891. He is now in exile.

A party that represents all the heterogeneous elements of discontent is the Boulangist party (see BOULANGER), of whose leaders Henri Rochefort (q.v.) and Paul Déroulède (q.v.) are the best known. Recent events, however, notably the exposure of the unpatriotic spirit of the movement by Paul Mermeix, have thoroughly discredited this faction, and in the legislative chamber in 1891 it was represented by barely 20 members.

POLITICAL PARTIES, GERMAN. Modern parties in Germany sprang out of the historical conditions under which representative institutions were set up half a century ago, and the antagonisms aroused by serious measures during the long ministry of Bismarck. Of these two sources the first is not only the earlier in point of time, but also the more general in character and the more lasting in its effects. For, since the new charters and parliaments were granted in most of the German states by unwilling provinces to uneasy or rebellious subjects, and were almost revolutionary experiments, the

discontent of the courtiers, the fears of the timid, the rage of those who hated progress, and the enthusiasm of those who welcomed it naturally determined the first and principal line of division between parties. In every one of the new legislatures there was a body of men who believed in extending and enlarging the liberties already won, in carrying onward the work of reform. In every one there was a body who deprecated and opposed any further departure from the old state of things. But these two chief divisions of liberals and conservatives were as naturally subdivided into groups distinguished by the quality of their liberalism or conservatism; and thus minor parties arose, making the work of legislation difficult. On the death of the weak king Frederick William IV., in 1861, and the accession of William I. the cause of prerogative found a stanch champion, and the fear of reaction united the liberal members of the Diet in a more compact party under the name of Progressists. The answer of the king, in 1862, was the appointment of Bismarck as prime-minister. Then followed what is known as the "Period of Conflict," the four years during which the king and his minister collected and disbursed the revenues, reorganized the army, fought two wars, reversed the foreign policy of the country, and formed the North German Confederation, in spite of the liberal majorities in the lower house of the nation, and of the constitution.

But the victory of Sadowa broke up the "Party of Progress." The more moderate of its members accepted the terms of peace which the victorious minister offered, and formed a new party called "National Liberals." In the scale of opinions between the two extreme wings it was what the French call the "Left Centre." Largely recruited from the professions and literary classes, it represented the intellectual *élite* of the nation; its numbers grew with successive elections, and without official recognition in the cabinet, it unselfishly though not blindly supported the further measures of unifications and reform during ten busy and fruitful years. Meantime the completion of imperial unity called a federal Diet into existence, in which the existing Prussian parties were to a great extent reproduced. An enumeration of the leading parliamentary groups about the year 1872 will show how the course of events had modified the two great divisions of the "Conflict Period." After the secession of the "National Liberals" in the Prussian Diet the "Party of Progress" remained a mere fragment, which abhorred the compromise with Bismarck, and was generally in opposition. But this compromise and some of the measures which followed it were not less hateful to the former government party, and though the conservatives also split into two parties, the "Old Conservatives" who fought even the moderate reform that Bismarck was willing to propose, and the "Free Conservatives," who were his out-and-out supporters. The war with Rome called into being an Ultramontane party, known as the "Centre." The Jewish members formed a group united by a still different issue, and those from the annexed provinces of Schleswig-Holstein still another. All of these groups were reproduced, though in varying proportions, in the Diet of the empire. But here they were reinforced by two others, the protesting delegates from Alsace-Lorraine and the fiery representatives of the Social Democrats. No one of these parties formed more than a small fraction of the entire body. The government had to form its majority out of a combination of parties, and the majority was therefore a shifting one. The National Liberals and the Free Conservatives were usually secure; and although the Old Conservatives and the Progressists were now for and now against the government, they were nearly always on opposite sides, so that the union of either with the two faithful parties gave a majority for nearly every measure.

But in 1879 a further disruption of parties took place. In that year Prince Bismarck announced his conversion to the doctrine of protection, and a measure in that sense was laid before the Imperial Diet. But free trade had long been one of the most emphatic articles in the creed of all German Liberals; and foreseeing their opposition, the chancellor had made overtures to the Ultramontane "Centre" in order, with their forces added to the conservatives, to get a sufficient majority. Their support was purchased by some concessions in respect to the ecclesiastical laws, which still further alienated the liberals. When the vote came the National Liberals divided, part supporting the chancellor, part adhering to their own convictions. The bill was carried, but the old National Liberal party was practically dead. Next year the opposition members formally seceded, and still later fused with the "Party of Progress" under the new name of "German Liberals." For several years the anarchy in parliament was scandalous. No stable majority could be secured, and successive elections only made the situation worse. The so-called "Cartel" between the National Liberals and Conservatives enabled the budget and the most necessary measure to be passed; but the socialist legislation, the growing military burdens, the distress of the country increased every day the discontent of the people, as was strikingly shown in the general election of February, 1890. The result of this was disastrous to the government groups in the Diet. The National Liberals fell from 93 to 42, the Free Conservatives from 39 to 19, and the Conservatives from 76 to 67, while among the opposition parties the Centre rose from 99 to 106, the German Liberals from 36 to 70, and the Social Democrats from 11 to 35. Thus the most servile of Bismarck's supporters, the National Liberals, suffered the greatest loss, and the most radical of his opponents, the Social Democrats, enjoyed the largest gains. The increase in their total ratio of the polls was even more startling. Outside of the legislative bodies there is in Germany little formal organization or machinery of

parties. But inside the legislatures the organization is quite complete, and the discipline strict. Indeed, the term "party" is perhaps more often used to designate parliamentary groups than the original divisions of the voters themselves. Nearly every deputy is inscribed on the roll of some party, either as a member or as a "guest," a guest being one who is not subject to caucus rule; while to the unattached, parliamentary slang gives the name of "Wilden," or savages.

POLITICAL PARTIES, GREEK. The Greek Legislative Assembly, or *Boulé*, consists of 150 members, having been reduced to this number from 245 by a measure introduced by M. Tricoupis, the late premier, in the early part of 1886. The system of election is by *scrutin de liste* (q.v.), as once in France. From the death of M. Koumoundouros until 1890 the party leaders in Greece were M. Tricoupis and M. Delyannis, who have alternated as presidents of the Council of Ministers, as did MM. Koumoundouros and Tricoupis during the lifetime of the former. But in 1890 a section of the opposition, under M. Delyannis, broke away from him to follow M. Ralli, who is spoken of as chief of a Neo-Hellenic party. Its appearance on the eve of the electoral period seemed to be favorable to M. Tricoupis, who had to face a divided instead of a united opposition at the ballot; but, notwithstanding this state of parties, M. Tricoupis was defeated at the recent elections, in Oct., 1890, but returned to power in 1892, resigning again in May, 1893.

POLITICAL PARTIES, HUNGARIAN. The legislative power of Hungary is vested in the emperor of Austria, as king of Hungary, the Delegations (see POLITICAL PARTIES, AUSTRIAN), and a Reichstag, consisting of a House of Magnates and a House of Representatives. The former comprises 286 hereditary peers, some 50 high ecclesiastical dignitaries of the Roman Catholic, Greek, and Protestant churches, 82 life-peers, all the archdukes who have attained their majority, delegates from the Diet of Croatia-Slavonia, and others—460 magnates in all. The House of Representatives contains 453 members, elected by open voting and limited suffrage for periods of five years. The parties are distinguished as Liberals, Moderates, Independents, the Croatian delegates, who usually vote with the Liberals, and Nationalists, who vote now with one party and now with another. Until 1890 M. Tisza commanded the support of the majority in the chamber, but finding his authority waning after fifteen years' leadership, he has now retired, and sits as a simple deputy, his place at the head of the ministry having been taken by his colleague, Count Szapary, who was minister of agriculture in the Tisza Cabinet.

POLITICAL PARTIES, ITALIAN. The legislative authority of Italy rests with the king and two chambers, the Senate and Chamber of Deputies. The former (unlimited in number) is composed of princes of the royal house after attaining their majority, and of members nominated for life by the king. They must be upwards of forty years of age, and they are supposed to have justified their nomination by eminent services to their country. The Chamber of Deputies (Camera de' Deputati) is elected by *scrutin de liste* by conditional universal suffrage for periods of five years, and contains 508 members, or one to every 57,000 of the population. For electoral purposes Italy is divided into 135 districts, which again are subdivided. One-eighth of the inscribed electors must vote to render an election valid. The division of parties in the chamber is somewhat singular. The majority and the bulk of the minority alike profess liberal principles, the one being known as the Ministerial Left and the other as the Opposition Left, or Pentarchists, prominent members of which party are Signori Nicotera and Baccarini. There is also little difference in their political programmes. Forming part of the opposition are some minor groups of varying tendencies, including a knot of advanced republicans or socialists and the so-called moderate. There is little or no union in the opposition, and it is this that has constituted the chief strength of the Ministerial Left, which has, after successfully surviving some nine or ten ministerial crises, been uninterruptedly in power for fourteen years, a result in large measure due to the skilful leadership of the late Signor Depretis. On the death of the latter, on July 29, '87, the ministry underwent no change. As a matter of form its resignation was tendered, but was withdrawn at the request of the king, Signor Crispi taking over the presidency of the Council in addition to the portfolios of the Interior and of Foreign Affairs. After his advent to power, he was the loyal and devoted servant of the monarchy, and so far from disturbing Italy's relations with Austria and Germany, as the Irredentists fondly hoped, it remained for him definitively to cement the alliance of the central European powers. To this alliance he (Oct. 8, '90) declared his firm adherence, and sternly denounced Irredentism as the main danger to the country. Italy's greatest interests, he declares, are identified with the House of Savoy. His fall, in 1891, on a question of finance, and the accession to power of the Marquis di Rudini (q.v.), resulted in a real though not acknowledged weakening of the Triple Alliance (q.v.), and signs of a *rapprochement* with France. The weakness of the Italian political system is at present the abstention from voting of the Catholic party, who refuse to hold office or to exercise political power under a government that continues to ignore the pope's claims to temporal power. Hence, the members of Parliament do not represent the people as a whole, but only one portion of them—a source of danger to the whole governmental system.

POLITICAL PARTIES, PORTUGUESE. The legislature of Portugal is the Cortes, consisting of two houses, the Camara dos Pares and the Camara dos Deputados. By a law passed in 1885, hereditary peerages are being abolished by gradual process, and the

king's right to nominate peers will finally be limited to a hundred, exclusive of royal princes. In addition there are 50 elective peers, who must be more than 35 years of age. The second chamber is composed of members with an income of not less than 390 milreis per annum. They are elected under a system of universal suffrage every four years, and number about 170. They are divided roughly into Conservatives, Progressists, and Republicans ; but there are subdivisions and independent groups. At the election of 1890, 157 out of the 170 were classified as 114 Conservatives, 30 Progressists, 10 Monarchists of other shades, and 3 Republicans. To judge by the power of the republican press in Portugal, the country is much more republican than these figures would indicate. Since the explosion of public feeling against England in connection with the partition of Africa, the ministries of Portugal have found themselves very unstable. In Oct., 1890, a new political association was formed in Portugal called the Liberal League, said to number among its adherents some of the most prominent members of the cabinet. It demands of the government the impartial execution of the laws, respect for the liberties of the people, economy and inflexible probity of administration, and care to safeguard the dignity and interests of Portugal abroad, especially against what it regards as the arrogant encroachment of England upon the colonial possessions of Portugal in Africa.

POLITICAL PARTIES, SERVIAN. The political life of Servia centres in the Narodna-Skuptschina, or National Assembly, the members of which may be divided into Liberals, or pro-Russians, Radicals, or pro-Austrians, and Progressists, who also lean to the side of Austria, while, in common with the Radicals, they aim at the continued independence of the kingdom. There is also the Greater Skuptschina, which is four times as large as the National Assembly, and is only convened when it is necessary to take a decision upon vital and constitutional questions. It is elected entirely, however, by the people, every tax-paying Servian having the right to vote.

POLITICAL PARTIES, SPANISH. The Cortes, or parliament of Spain, consists of two bodies, a Senate and a Congress. The Senate is composed of three classes : those who sit by right of birth or official position, of members nominated by the crown (these two classes not numbering more than 180 together), and of 180 elected by the largest taxpayers of the kingdom and certain corporate bodies. Political parties are broken up into groups, most of which are named in the '90 ed. Their origin may be traced back to '12, when, at the beginning of a great reform movement in Spain, there were two great parties—the Royalists (nicknamed *los serviles*) and the Liberals. Some eighteen to twenty years ago there arose the Republicans, who were divided into followers of Señor Manuel Ruiz Zorilla and of Señor Castelar, and of Señor Pi y Manargall, the last named being in favor, as the leader of the Federalist party, of provincial autonomy. Señor Canovas del Castillo is the chief of the Conservative party, who are devoted to the monarchy. Señor Sagasta sought to establish a party system on the old lines, uniting Conservatives and Liberals against the extreme Republicans on the platform of support to the monarchy and the constitution of '76. In course of time the Conservatives began to complain that he conceded too much to the Republicans, and he had a strong fight for his position, and found his majority constantly menaced by coalitions. Consulting what he believed to be the feeling of his country, he acceded to the demand for a restoration of the universal suffrage law. Upon that demand and upon his budget he had a hard fight, and, though he ultimately carried both, was obliged in July, '90, to retire from office, succumbing to the difficulties of an incohesive majority and a persistent opposition. Señor Canovas del Castillo then took office, not without many protests against his being allowed to carry out the first elections under a new suffrage, to which he was so vehemently opposed.

POLITICS. See GOVERNMENT.

POLIZIANO, ANGELO, whose name is perhaps better known under the Latin form of POLITIANUS, was the son of a doctor of civil law, and was b. at Montepulciano in Tuscany, July 14, 1454. The family name was Ambroginis, but Poliziano took his from his native town—in Latin, *Mons Politianus*. He studied Latin at Florence under Cristoforo Landia, Greek under Andronicus of Thessalonica, the Platonic philosophy under Marsilio Ficino, and the Aristotelian under Argyropulos. He also devoted some attention to Hebrew. Poliziano's talent for poetry was early developed. When scarcely 15 years of age he took the Florentines with surprise by the publication of his famous *Stanze* (a poem of 1400 lines) in honor of Giulio de Medici, who had carried off the palm at a tournament. Lorenzo de Medici took notice of the brilliant lad, and at once placed him in a condition to continue his studies without any pecuniary harassments, by appointing him tutor to his two sons, and subsequently gave him a residence in his charming villa near Fiesole, where Poliziano, who was passionately fond of country life, resumed his studies with fresh ardor. In 1484 he accompanied the Florentine ambassadors to Rome, and was received in a flattering manner by the pope, at whose request he translated (into Latin) the Greek historian Herodianus, for which he received 200 golden crowns. He also made Latin versions of the *Enchiridion* of Epictetus, the *Charmides* of Plato, and other works, with such elegance, that Erasmus pronounced him a master in translation. After having filled for some years a chair of Latin literature, he commenced the teaching of Greek. His popularity as a professor was great. Pupils came to study under him from all the great cities of Italy, and even from distant parts of Europe; the principal were Francesco Pucci, Fortiguerra, Maffei de Volaterra, P. Crinitus Guillaume

Grocyn, Thomas Linacre, and Michael Angelo. His copies of Ovid, Statius, Pliny the younger, Quintilian, etc., and other authors, are still preserved in the different libraries of Italy, and are covered with marginal notes. His copy of the famous *Digest* of Roman law, with an elaborate philological and grammatical commentary, is still preserved in the Laurentian library at Florence. In 1489 appeared his *Miscellanea*, a collection of critical and other observations on the ancient authors. Toward the close of his life he entered into orders, and was made canon of the cathedral of Florence. He died Sept. 24, 1494. Among the brilliant scholars of the classical renaissance, Poliziano occupies a foremost place in virtue of his vigor and originality. His intellect was indeed penetrated by an admiration of the chaste and noble literature of antiquity; but there was nothing servile in his imitations; he reproduced without difficulty—because he was a himself a kindred genius—the strength of Tacitus, the elegance of Livy, and the conciseness of Sallust; his Latin poems, especially his elegies, display the beauty and ardor of his imagination. Among his vernacular pieces may be mentioned his *Canti Carnascialeschi* (Carnival or Merry Ballads), remarkable for their felicity of style, sweetness of pathos, and abundance of imagery. Another proof of his varied poetical power was his *Orfeo*, one of the earliest dramatic compositions produced in Italy. The editions of Poliziano's separate writings have been numberless. See Seraszi's *Vita di A. Politiano;* N. A. Bonafous's *De A. Politiani Vita et Operibus* (Paris, 1845), Tiraboschi's *Storia della Litterat. Italiana;* Greswell's *Memoirs of Politiano,* and Roscoe's *Lives of Lorenzo de Medici and of Leo X.*

POLK, a co. in w. Arkansas, watered by Cossatot river, the Brushy fork of Ouachita river, and Saline bayou; about 935 sq.m.; pop. '90, 9283. Co. seat, Dallas.

POLK, a co. in central Florida, bounded on the e. by Kissimmee lake and river; about 2060 sq.m.; pop. '90, 7905, incl. colored. Co. seat, Bartow.

POLK, a co. in n.w. Georgia, adjoining Alabama, drained by Coosa river and Euharlee creek; 330 sq. m.; pop. '90, 14,945, includ. colored. Co. seat, Cedartown.

POLK, a co. in s. central Iowa, drained by the Des Moines, Raccoon, and South Skunk rivers and Beaver creek, traversed by the Chicago, Rock Island, and Pacific, the Des Moines and Kansas City, the Wabash, and other railroads; 576 sq. m.; pop. '90, 65,410, chiefly of American birth. Co. seat, Des Moines.

POLK, a co. in n.w. Minnesota, adjoining N. Dak., bounded on the w. by the Red river of the North, drained by Red lake and Wild Rice rivers, traversed by the Northern Pacific and other railroads; about 3030 sq. m.; pop. '90, 30,192. Co. seat, Crookston.

POLK, a co. in s.w. central Missouri, drained by the Pomme de Terre and Little Sac rivers; about 640 sq.m.; pop. '90, 20,339. Co. seat, Bolivar.

POLK, a co. in e. central Nebraska, bounded on the n.w. by the Platte river, drained also by the north fork of the Big Blue river; about 439 sq.m.; pop. '90, 10,817, chiefly of American birth. Co. seat, Osceola.

POLK, a co. in s. North Carolina, adjoining South Carolina; drained by Green river; about 276 sq.m.; pop. '90, 5902, inclu. colored. Co. seat, Columbus.

POLK, a co. in n.w. Oregon, bounded on the e. by Willamette river; drained by the Rickreal and the s. fork of the Yam Hill rivers; about 615 sq.m.; pop. '90, 7858. Co. seat, Dallas.

POLK, a co. in e. Tennessee, adjoining Georgia, drained by the Ocooee and Hiawassee rivers; about 400 sq.m.; pop. '90, 8361. Co. seat, Benton.

POLK, a co. in e. Texas, bounded on the s.w. by Trinity river; watered by Sandy and other creeks; about 1200 sq.m.; pop. '90, 10,332. Co. seat, Livingston.

POLK, a co. in n.w. Wisconsin, adjoining Minnesota; bounded on the w. by St. Croix river; drained also by Apple river · about 955 sq.m.; pop. '90, 12,968. Co. seat, Osceola Mills.

POLK, James Knox, eleventh president of the United States of America, was born in Mecklenburg co., N. C., Nov. 2, 1795. His ancestors, who bore the name of Pollock, emigrated from the n. of Ireland early in the 18th century. Though his father was a farmer in moderate circumstances, he was educated in the university of North Carolina, and studied law with Felix Grundy of Tennessee, an eminent lawyer and statesman. Admitted to the bar in 1820, he was three years after elected a member of the legislature of Tennessee, and soon after to the federal congress by the democratic party. In 1826 he was chosen speaker of the house of representatives, a position he filled during five sessions with firmness and ability. After serving fourteen years in congress he was, in 1839, elected governor of Tennessee; and in 1844 unexpectedly nominated, as a compromise candidate, for the presidency, against Henry Clay, and elected. During his term the Oregon boundary was settled by a compromise offered by England, though the party cry which helped to elect him was a claim for the entire territory to 54° 40′ n. lat. The annexation of Texas caused, in 1846, a war with Mexico; 50,000 volunteers, added to the small regular force, sufficed to take the capital (Sept. 14, 1847), and enabled the government to dictate terms of peace, by which it acquired California and New Mexico. Having pledged himself to a single term of office, Mr. Polk refused a renomination, and retired to his home in Nashville, Tenn., where he died three months afterward, June 15, 1849. Mr. Polk was a man of respectable abilities, and of a solid, firm, honest, and religious character. He was devoted to the principles of the democratic party of Jeffer-

son and Jackson—state rights, a revenue tariff, independent treasury, and strict construction of the constitution.

POLK, Leonidas, d.d., 1806–64; b. N. C.; graduated at West Point in 1827; was appointed brevet second lieutenant of artillery, with leave of absence. Resigning, he studied theology, and was ordained in the Protestant Episcopal church in 1831; missionary bishop of Arkansas and Indian Territory, with the provisional charge of the diocese of Alabama and Mississippi, in 1838–41; bishop of Louisiana in 1841–61. In 1861 he took up arms against the union, was appointed major-general of the Confederates; occupied Columbus, Ky., Sept., 1861, and evacuated it Mar., 1862; commanded a division at the battle of Shiloh in April, 1862, also at Murfreesboro, Chattanooga, and Chickamauga; served as lieutenant-general at the battle of Stone river in 1863. He was killed near Kenesaw mountain, Ga., in June, 1864.

POLK, Thomas, b. N. C. about 1732; was the owner of a large estate near Charlotte; took part in the war of the revolution; led an expedition against the tories of North Carolina; was commissary-general for the state. He d. in Charlotte, N. C., in 1793.

POLK, William, 1758–1834; b. N. C.; present at the Mecklenburg declaration of independence, 1775; joined the army of the revolution 1777; was in the battles of Brandywine and Germantown; with Generals Gates and Greene in the southern states, and was wounded at Eutaw Springs; after the war, was in the legislature of North Carolina, 1787; removed to Raleigh and was an active politician; declined a nomination as brigadier-general, 1812, because of his opposition to the war with England; was himself a witness and collected the testimony of others to establish the genuineness of the Mecklenburg declaration. He lived to be the last surviving field officer of the North Carolina line.

POLKA, a species of dance, of Polish or Hungarian origin, the music to which is in $\frac{2}{4}$ time, and has the rhythmical peculiarity of being accented on the third quaver of the measure. It was introduced as a fashionable dance into western Europe about 1841.

POLLACK, *Merlangus pollachius*, a fish of the family *gadidæ*, of the same genus with the whiting and coal-fish. It is common on the coasts of all parts of Britain; and in Scotland and some parts of Ireland it is called *lythe*. It is a very playful fish, often gambolling on the suface of the water. It attains about the same size as the coal-fish. It has three dorsal fins; the body is of a longish shape; the lower jaw is much longer than the upper; the tail is slightly forked. The flesh is reckoned superior to that of the coal-fish. Young pollacks are sometimes sold as whitings, to which, however, they are not nearly equal. No fish more readily rises to the artificial fly, and in this way great numbers are caught on the British coasts. The fly is merely a bit of white feather tied to a common bait-hook. Worsted is sometimes used instead of the feather; and flies of different colors are sometimes used together, with great success No reel is employed, and any stick is good enough for a rod; a few yards of string make a sufficient line.

POLLAN, *Coregonus pollan*, a fresh-water fish of the family *salmonidæ* (q.v.), a native of lakes in Ireland. It is particularly abundant in lough Neagh, where it is often seen in large shoals, which issue from the deep waters, and haunt the shore from spring to autumn, when great numbers are taken by nets, and sold in the neighboring country. The pollan is from 10 to 12 in. in length; it resembles the gwyniad, but has not the snout produced like that fish; and there are differences in the size and position of the fins. It is very like *coregonus sikus*, a species found in the most northern parts of Norway.

POLLANARRUA, an ancient city of Ceylon now in ruins, in the province of Tamankadme, about 60 m. n.e. of Candy. It was the capital, 769–1319. It was a large and splendid city in the reign of Prakrama Bahoo I., who surrounded it with a rampart. The streets were from 16 to 26 m. long. It contained a palace of 7 stories, two edifices of 5 stories for priests and devotees, and a coronation hall, all built by Prakrama Bahoo, also the Rankot Dagoba, built by his queen, several hospitals, a college for medical students, built by king Dappola I.; also a superb structure of several stories containing a golden image of Buddha. The city was repeatedly taken by the Malabars, and recovered by the Singhalese, but the last time the Malabars took it, about 1204, they demolished and reduced it to its present condition. The most remarkable building is the Jaitawanarama temple. Opposite the entrance is an image of Gautama Buddha 50 ft. high. The Satmaha Prasada is a handsome pyramidal building. The palace of Prakrama Bahoo I. is on the borders of the Toopawewa, an artificial lake, the waters of which were carried through the buildings and poured by an ornamented spout into the king's bath, which is a large circular space built of hewn stone. There are two stones covered with inscriptions, one of which, neatly ornamented, is 25 ft. long and 4 broad. The characters are small and beautifully cut, and for the most part Singhalese.

POLLARDING (*to poll*, to cut off, or shave the head) is the cutting off of the whole crown of a tree, leaving it to send out new branches from the top of the stem. Trees thus treated are called *pollards*. The new branches are never equal in magnitude to the original branches of the tree, although often more numerous, and when pollarding is often repeated, the scars and stumps form a thick ring at the top of the stem, from which many small branches spring. Pollards are not beautiful; but pollarding is practiced with advantage in districts where fuel is scarce, the branches being cut off in order to be used for fuel, and the operation repeated every third or fourth year. It is much more

prevalent in many parts of Europe than in any part of Britain, and in Britain is almost confined to those districts of England which are furthest from coal. Willows, poplars, alders, elms, oaks, and limes are the trees most frequently pollarded, and in some parts of Europe the white mulberry. The trees of most rapid growth are preferred where fuel is the object; and willows, poplars, and alders are planted along water-courses, and in rows in moist meadows and bogs. Oaks are sometimes pollarded chiefly for the sake of the bark of their branches, and the whole treatment very much resembles that of copse-wood. In some parts of Germany, landscapes may be seen of open country with many scattered oak and elm pollards, presenting a very peculiar appearance.

POLLEN. See STAMENS and FECUNDATION.

POLLEN'ZA, a well-built t. in the northern part of the island of Majorca, about 2 m. w. of the bay of Pollenza, and 30 n.e. of Palma. It has a Jesuits' college and some manufactures of black woolen cloth. Pop. comm. 9200.

POLL-EVIL is a painful swelling on the head or the neck of a horse, which, if not carefully attended to, may become a troublesome and serious ulcer. It is caused in several ways: as from suddenly lifting the head and striking it against a beam; or from straining against the halter; or by an excessively tight rein when driving, thus producing an unnecessary and painful tension of the ligaments and muscles of the head and neck. The disease is somewhat difficult to treat, it being seated between the ligaments and the bone. The first treatment should be to subdue the inflammation. This may be accomplished by the use of cold applications, with more rigorous treatment, if necessary. If these do not suffice, and the swelling continues to increase, so that it becomes evident that pus is forming, then other measures must be employed. The formation of pus must be hastened as rapidly as possible by hot applications, and as soon as this is brought about, which may be known by the tumor's being soft to the touch, it must be lanced, and just at this point lies the secret of success in curing the disease. *All the pus must be discharged,* and the means employed—as, e.g., a seton—must be such that any future formation of pus shall run out immediately, thus preventing any corrosion of the bone beneath the tumor. This is all the treatment required, except fomentations of tepid water to insure cleanliness, if the disease be taken in its early stages. The reader is referred to *Youatt on the Horse.*

POLLIO, CAIUS ASINIUS, a politician, soldier, and author of considerable merit, and still more considerable reputation, was b. in Rome 76 B.C., but belonged to a family of Marrucinian descent. His first ambition was to be an orator, and in his youth he seized every opportunity of hearing such men as Hortensius and Cicero. When civil war broke out between Cæsar and Pompey, Pollio sided with the former, was present at the crossing of the Rubicon, and accompanied the great general in his rapid triumphal march through Italy. He joined Cæsar in his expedition to Greece against Pompey, and took part in the decisive battle of Pharsalia, 48 B.C. At the time of Cæsar's assassination (Mar. 15, 44 B.C.), Pollio was governor of Hispania Ulterior (further Spain), and carrying on the war against Sextus Pompey. In the subsequent struggles, he sided with the triumvirate (Antony, Lepidus, and Octavian) against the oligarchic senate; and on the triumph of the former, was appointed administrator of transpadane Gaul, in which capacity he saved the property of the poet Virgil at Mantua from confiscation. After Antony and Octavian had quarreled, it was Pollio who effected their temporary reconciliation at Brundusium, 40 B.C.; next year he conducted a successful campaign against the Parthini, a people of Illyria, and in consequence, obtained a triumph. After this event, however, he withdrew altogether from political life. He lived 18 years after the emperor Augustus, dying at his Tusculan villa, 4 A.D., in the 80th year of his age. Besides having a reputation for oratory, Pollio was celebrated as a historian, poet, and critic; and there seems little reason to doubt that he was an author the loss of whose writings is to be regretted. His literary and political criticism of his contemporaries, in particular, appears to have been valuable. He also claims remembrance as a distinguished patron of men of letters, such as Catullus, Horace, Virgil, and as the founder of the first public library at Rome.

POLLNITZ, KARL LUDWIG VON, noted as a writer of memoirs of his time, was b. near Cologne in 1692. He was equally remarkable for his talents and want of principle; and while his father's position as minister of state to the elector of Brandenburg gave him access to court-circles, his extravagance and eccentricity, coupled with his vagabond habits, often reduced him to the greatest poverty. But after wandering all over Europe, taking service in the church in Austria, and in the army in Spain, he finally attracted the favorable notice of Frederick the great, who appointed him his reader, and made him director of the theater at Berlin. After having twice changed from Catholicism to Calvinism, he proclaimed himself a member of the church of Rome shortly before his death, which occurred in 1775. Among the numerous memoirs, either written by or ascribed to him, the following were the most popular in their day, and the most applauded for the powers of observation and the wit which they exhibit: *Lettres et Mém., et la Relation de ses premiers Voyages* (Amst. 1735); *Etat abrégé de Saxe sous Auguste III.* (Frankf. 1734); *Hist. secrète de la Duchesse d'Hanovre, épouse de George I.* (Lond, 1732). After his death, Brunn brought out Pollnitz's *Mémoires pour servir á l'Histoire des quatre derniers Souverains de la Maison de Brandenbourg* (2 tomes, Berl. 1792).

POLLOCK. See POLLACK.

POLLOCK, Sir FREDERICK, 1783–1870; b. England; brother of Sir George; graduated at Cambridge in 1806, and a year later became a fellow of Trinity college, and was admitted to the bar, of which he became a distinguished member. In 1827 he was king's counsel, and was knighted in 1834. He was the representative from Huntingdon in parliament 1831–44, and served as atty.gen. under sir Robert Peel in 1834–35, also 1841–44. He was lord chief-baron of the court of exchequer and privy counselor 1844–66, after which he retired with a baronetcy.

POLLOCK, Sir GEORGE, 1786–1872; b. England; received his education at Woolwich academy. In 1802 entered the army as lieutenant of the Bengal artillery, in service of the East India company, and in 1805 became captain. He took part in the sieges of Dieg and Bhurtpore in 1809, and was promoted to the rank of colonel; became major-general in 1841, and a year later took command of the British troops in the war against the Afghans, forced the Khyber pass, and a few months later, reduced Cabul to submission. For these valuable services, on his return to London, he received a pension of £1000 from the East India company, of which he was a director for 2 years. Many marks of distinction were conferred upon him, among which were the freedom of the city of London, and the order of grand commander of the Star of India. He was brevetted field-marshal, and became constable of the tower of London in 1871, and baronet in 1872.

POLLOCKSHAWS, a municipal borough in the co. of Renfrew, Scotland, is situated on the banks of the White Cart, about 3 m. s.w. of Glasgow. The name is derived from the estate of Nether-Pollock, on which the town stands, and from the Scotch word "shaw," which means a "grove" or "plantation." Pollockshaws is entirely a manufacturing town; cotton-spinning, calico-printing, silk-weaving, bleaching, iron-founding, and fancy dyeing are extensively carried on. Pop. '91, 10,228.

POLLOK, ROBERT, a Scottish poet, was b. in 1799 at Muirhouse, in the parish of Eaglesham, in the co. of Renfrew. After receiving the ordinary course of instruction in country schools, he was sent to the university of Glasgow, and on the completion of his curriculum in arts, he entered the divinity hall of the secession church, where he studied 5 years. In 1827 he was licensed to preach. By this time he had written the *Course of Time,* and its composition, together with the ardor with which he pursued his studies, brought on consumption. The poem was published by Mr. Blackwood in the same year in which the author received license. It was highly praised, but the voice of praise fell on a dying ear. In his critical state, his medical attendants recommended residence for a time in Italy, and in compliance with their advice, he set out, accompanied by his sister. On his arrival in London, his symptoms became suddenly worse, and unable to prosecute his journey, he went to reside at Shirley common, near Southampton, where he died on Sept. 17, 1827. He was interred in the churchyard at Millbrook, and over his grave an obelisk has been erected.

The *Course of Time* ran through more than twenty editions, and is extremely popular in Scotland. It is a work of genius, but curiously unequal in merit. It contains eloquent and spirited passages, but considerable portions of it read like a dull sermon turned into blank verse. The writer drew his inspiration from nature, from Milton, and the shorter catechism—from the last, perhaps, most of all. His memoir, written by a brother, was published in 1843. Pollok also wrote *Tales of the Covenanters,* which were published anonymously.

POLL-TAX. See CAPITATION.

POLLUX. See CASTOR AND POLLUX.

POLLUX, JULIUS, b. at Naucrates, Egypt, and flourished in the reign of the emperor Commodus in 183 A.D. After a preparatory training under his father, he studied under the Sophists, and became a learned grammatical critic. He opened a school of rhetoric at Athens, and became so famous that he was made preceptor of the emperor Commodus. He prepared for the use of the emperor an *Onomasticon,* a Greek vocabulary divided into 10 books, designed to facilitate the learning of the Greek language by the young prince. It contains a variety of synonymous words and phrases, is useful in the study of Greek literature and art, and is valuable also because in the first part it treats of the gods and their worship. An edition was published by Dindorf at Leipsic in 5 volumes, and followed by that of Bekker of Berlin. Pollux was the author of several works, of which Suidas has preserved the titles.

PO'LO may be described as hockey on horseback. It is a game of Asiatic origin, and was introduced into England in 1872 by cavalry officers who had learned it in India. Two goals, as for football, are set up about 350 yds. apart, and the object is to drive a ball about the size of a cricket-ball through the goal by striking it with long sticks having bent or crooked ends. The players are mounted on ponies, and much depends on the skill with which these are managed. Four or five a side are the usual numbers, and those scoring the greater number of goals win the game. Polo has become very popular among English cavalry officers, and a few clubs have also been formed.

POLO, MARCO, the celebrated traveler, was born of a noble family of Dalmatian origin, at Venice, about 1254. His father, Nicolo Polo, and his uncle, Matteo Polo, both emi

nent merchants, had, previous to his birth, set out on a mercantile expedition, visiting Constantinople, Soldaya or Sondach (on the Euxine), and Bulgar (on the Volga), the capital of Barkâi, the khan of Keptchak. Thence they traveled round the north side of the Caspian sea to Bokhara, where they remained three years, studying the Mongol language and trading; but in 1261, some ambassadors from the Perso-Mogul khan to Kûblai (q.v.), the grand khan of the Mongols, happening to pass through Bokhara, the brothers Polo resolved to accompany them to Kemenfu, the summer residence of the khagan. They were well received by Kûblai, who was very inquisitive concerning the peoples and mode of government in Europe, and commissioned them to act as his envoys to the pope, bearing a written request for 100 Europeans, well learned in the sciences and arts, to act as instructors to the Mongols. They reached Venice in 1269; but finding it impossible to discharge the mission with which they had been intrusted, they set out on their return in 1271, taking with them young Marco, and arrived again at the court of Kûblai khan in 1275. Their second reception was still more honorable than the first, and the khagan took special notice of Marco, from the rapidity with which he learned the customs and language of the Mongols. His wisdom and the nobility of his demeanor also recommended him as a fit envoy to the various neighboring rulers; and during his residence at their several courts, Polo was in the habit of closely observing the manners and customs of the country, and delivering on his return a detailed report to the khagan. These reports were the groundwork of the book which informs us regarding the state of central and eastern Asia in the end of the 13th century. Polo's first mission was to the court of Annam or Tonquin (1277), and during his residence there, he acquired much information, both from his own observation and from report, concerning Thibet, Yunnan, Bengal, Mien (or Pegu), and the south of China; he was next employed to aid in making an inventory of the archives belonging to the court of the Song dynasty; and soon afterward was appointed governor of the town of Yang-tchow, in the province of Kiang-si, in eastern China, a post he held for three years. He also accompanied a Mongol army to the attack of the kingdom of Pegu; and closed the list of services rendered to Kûblai by accepting the embassy to Tsiampa, the south part of Cochin-China. Having thus passed 17 years in the service of the Mongol khan, and visited the chief countries and cities in eastern Asia, traveling through kingdoms (as China) which no European had ever seen before, and acquiring much knowledge of other kingdoms (as Japan, called by Polo *Zipangu*), the existence of which was not even suspected, he succeeded in obtaining permission to join the escort of a Mongol princess, who was traveling to the court of Persia. The three Polos accordingly set out in 1291, traveling through China, and thence, by sailing through the Chinese sea and Indian ocean, finally arrived at Teheran, where they stayed for some time; but learning that Kûblai khan was now dead, they continued their journey, and arrived at Venice in 1295, bringing with them much wealth and many precious objects, the fruits of their trading. Marco, in the following year, fought his own galley in the great battle off Curzola, in which the Venetians, under Dandolo, were defeated by the Genoese under Doria, and was taken prisoner and immured in a dungeon at Genoa. Here he dictated, with the aid of the memoranda he had made during his travels, an account of his journey through the east, which was subsequently revised with care. After his liberation he returned to Venice, where he was appointed member of the grand council, and died in 1324, eleven years after his father. His work is variously entitled, but the best edition is *Il Milione di Messer Marco Polo Veneziano*, edited by Count Baldelli (Florence, 4 vols. 4to, 1827), and accompanied with a map, notes, and illustrations. Polo's narrative created an immense sensation among the learned public, and many did not hesitate to affirm that it was a pure fiction; but the Catholic missionaries and subsequent Venetian travelers into these remote regions, verified many of Polo's statements, and then came a reaction of public opinion; Polo's wonderful minuteness, extensive research, and accuracy being the theme of universal admiration. His work was of inestimable value as a stimulant and guide in geographical research; it encouraged the Portuguese to find the way to Hindustan round the cape of Good Hope; and it roused the passion for discovery in the breast of Columbus, thus leading to the two greatest of modern geographical discoveries. The first Italian edition appeared at Venice in 1496, and has been often reprinted. A new edition, edited by Bartoli, was published, 1864. One of the best translations is the standard English one by Col. Yule, 1871, new edition, 1875, with maps, plates, and illustrations derived largely from oriental sources.

POLONAISE. See POLACCA.

POLOTSK', a t. of west Russia, in the government of Vitebsk, on the banks of the Düna, where that river is joined by the Polota. It was founded in the 9th c., is the seat of a bishop of the Greek United church, and has several churches, besides a convent and a school for the nobility. Here, in 1812, the Russian general, Wittgenstein, defeated the French under Oudinot and Sire. Pop. 20,064.

POLTAVA, a government of Little Russia, between the governments of Kiev on the w. and Kharkov on the e. Area 19,265 sq. m.; pop. '90, 2,898,600. The surface is flat, with a gradual slope s.w. to the banks of the Dnieper, which forms the southern boundary, and into which the chief rivers—the Sula, Psiol, and Worskla—flow. The government does not abound in wood, but possesses rich and extensive pastures. The soil is for the most part clay and fertile vegetable mold, and the climate is healthy. Agricul-

ture and cattle-breeding are the staple occupations. Many of the peasantry are employed with their oxen in bringing salt from the lakes of the Crimea, and fish from the Don. The manufactures are not numerous nor important. Commerce is chiefly in the hands of Jews, and is mostly transacted at the fairs, the most important of which are those of Poltava and Romny.

POLTAVA, chief t. of the government of the same name, is situated on the right bank of the Worskla, a tributary of the Dnieper, 87 m. by rail s.w. of Kharkov. Pop. '97, 53,060. Poltava has few manufactures, and its trade displays activity only during the annual fairs, of which there are four. The most important is called the Illinsky, which lasts about a month. At this fair wool is sold worth about $7,250,000. The principal articles of traffic are cloths, woolen tissues, colonial productions, fur, wool, horses, and agricultural produce and implements. Poltava is famous as the scene of Charles XII.'s defeat by Peter the Great in 1709, and a monument commemorating the victory of the czar stands in the principal square; while three m. from the t. a mound, surmounted by a cross, still known as the "Swedish Tomb," marks the battle-field. Poltava has a cathedral, numerous churches, and a school for cadets.

POLYANDRY, or POLYANDRIA, that form of polygamy which permits a woman to have several husbands. See MARRIAGE. The hot-bed of polyandry is Thibet. There a wife commonly is the wife of a whole family of brothers—the elder brother being chief husband. In the Himalayan and sub-Himalayan regions adjoining and under the influence of Thibet it is of frequent occurrence in the same form; as in the valley of Cashmere, in Ladak, among the Koech, among the Telingese. Further s. in India, we find polyandry among the Tudas of the Nilgherry hills, the Coorgs of Mysore, and the Nayars of Malabar. We find it again off the Indian coast in Ceylon; and going eastward, strike on it as an ancient though now almost superseded custom in New Zealand, and in one or two of the Pacific islands. Going northward, we meet it again in the Aleutian islands; and taking the continent to the w. and n. of the Aleutians, it is found among the Koryaks, to the n. of the Okhotsk sea. Crossing the Russian empire to the w. side, we meet it among the Saporogian Cossacks; and thus have traced it at points half round the globe. This is not all, however. It is found in several parts of Africa, and it occurs again in many parts of America among the red men. We have the authority of Humboldt for its prevalence among the tribes of the Orinoco, and in the same form as in Thibet. "Among the Avarces and the Maypures," he says, "brothers have often but one wife." Humboldt also vouches for its former prevalence in Lancerota, one of the Canary islands. Thus, polyandry is a phenomenon of human life, independent of race and country.—See Latham's *Descriptive Ethnology* (1859), vol. i. pp. 24, 28; vol. ii. pp. 398, 406, and 462; Humboldt's *Personal Narrative*, Williams's translation, 1819, vol. v. part 2, p. 549; and chap. i. vol. i. p. 84; Hamilton's *New Account of the East Indies* (Edin. 1727), vol. i. pp. 274 and 308; Reade's *Savage Africa*, p. 43; Erman's *Travels in Siberia*, vol. ii. p. 531; *Marriage Ceremonies*, by Seignior Gaya (translation), 2d edition (Lond. 1698), pp. 70 and 96; Emerson Tennent's *Ceylon*, 3d edition (1859), vol. ii. p. 429; Grey's *Polynesian Mythology* (1855), p. 81; *A Summer Ramble in the Himalayas* (1860); Vigne's *Kashmir; Journal Asi. Soc. Bengal*, vol. ix.; *Asiat. Resch.*, vol. v.; also M'Lennan's *Primitive Marriage* (1865); and Herbert Spencer's *Principles of Sociology* (1876); Réclus, *Primitive Folk* (1891).

From ancient history we learn that the area over which polyandry at one time existed was even more extended; while in certain cantons of Media, according to Strabo (lib. ii. p. 798, and see Goguet, vol. iii. book vi. c. i.) polygynia was authorized by express law, which ordained every inhabitant to maintain at least seven wives; in other cantons, precisely the opposite rule prevailed: a woman was allowed to have many husbands, and they looked with contempt on those who had less than five. Cæsar informs us that in his time polyandry of the Thibetan type prevailed among the Britons (*De Bello Gallico*, lib. v. c. xiv.). We find direct evidence of its existence among the Picts in the Irish Nennius App. li., not to mention the traces of it remaining in the Pictish laws of succession. Indeed, to pass over communities in which something like promiscuity of intercourse between the sexes is said to have prevailed—such as the Massagetæ, Agathyrsi, and the ancient Spartans—we find several among which polyandry, or a modified promiscuity, must have been the rule. Assuming that the legal obligation laid on younger brothers in their turn to marry the wives of their deceased elder brother, is a relic of polyandry of the Thibetan type, then we must hold that polyandry prevailed at one time throughout India (*Institutes of Menu*, chap. iii. s. 173, and chap. ix. ss. 57, 58), among the ancient Hebrews (Deut. xxv. verses 5–11); in Siam, Burmah, in Syria among the Ostiaks, the But (Bodo), the Kasia, and the Puharies of Gurhwal. Traces of it indeed remained in the time of Tacitus among the Germans (Tac., *Germ.*, xx., Latham's edition, p. 67 et seq.). In short, polyandry may be regarded as one of the transitional forms in the advance from a state of promiscuity, on the assumption that pure promiscuity ever existed. Of the origin of this peculiar institution our space forbids us to write; but we believe it to be connected with the want of balance between the numbers of the sexes, due to the practice of female infanticide, which is its almost invariable accompaniment. Tribes of warriors, wholly devoted to a military life, find women an incumbrance rather than a solace; and from this cause, and probably from the difficul-

ties of subsistence, formed the practice of killing their female children, sparing them only when they were the first-born. The disparity of the sexes would lead to polyandry, and once instituted, the custom would in many cases continue to exist after the habits and necessities which produced it disappeared. In several places, as in Landak, where polyandry prevails, the sexes are now either equally balanced, or the female sex predominates. In these cases, polygynia and polyandry are commonly found existing side by side. The subject is one which demands, and as yet has not received full investigation.

POLYANTHUS (Gr. many-flowered), a kind of primrose (q.v.), much prized and cultivated by florists. It is generally believed to be a variety of the common primrose (*primula vulgaris*), produced by cultivation, in which an umbel of numerous flowers is supported on a common *scape* (leafless flower-stem), instead of each flower rising on its own stalk from the crown of the root; a modification to which a tendency often appears in the wild plant itself. Thus in its habit it somewhat resembles the cowslip and oxlip, whilst in the size of its flowers it is more like the common primrose; but instead of the pale uniformity of the wild plant, it exhibits great variety of delicate and beautiful colors. The subvarieties are innumerable, new ones being continually produced from seed, and of short duration. The seed is sown about midsummer, and flowers may be expected in abundance next year, if the young plants are properly planted out. A rich free soil is most suitable. The polyanthus loves shade and moisture more than its congener, the auricula. It is very hardy, and seldom suffers from the most severe winters. Fine kinds are preserved for a time by dividing the root. The cultivation of the polyanthus is prosecuted with particular assiduity and success in England.

POLYANTHUS NARCISSUS. See NARCISSUS.

POLYATOMIC ALCOHOLS. The term *alcohol*, originally limited to one substance—viz., spirit of wine, or ethyl hydrate, is now applied to a considerable number of organic compounds, many of which, in their external characters, bear little resemblance to common alcohol. Most of them are fluid and volatile, some of them are combustible, and all of them are composed of carbon, hydrogen, and oxygen, behave in a precisely similar manner toward the same decomposing agents, and are perfectly neutral to test-paper.

Every alcohol, when acted on by oxidizing agents, loses two atoms of hydrogen, and is converted into an *aldehyde;* and by the prolonged action of the oxidizing agent, the aldehyde takes up one atom of oxygen, and is converted into a *special acid.* Moreover, all alcohols, by the abstraction of the elements of water, yield ethers. Hence, every alcohol has its own ether, aldehyde, and special acid; the aldehydes of only a few of the alcohols termed polyatomic, have, however, been formed.

According to the theory of organic radicals, the alcohols are hydrates of alcohol radicals. Thus, common alcohol, or spirit of wine, is the hydrate of the radical ethyl, C_2H_5, and is represented by the formula $C_2H_5 \cdot OH$; similarly, wood-spirit is the hydrate of the radical methyl CH_3, and is represented by the formula $CH_3 \cdot OH$. According to the theory of chemical types (see TYPES, CHEMICAL), the alcohols are divided into *monatomic* and *polyatomic.* A molecule of water is represented by the formula H_2O, which may be arranged in the form $\left.\begin{matrix}H\\H\end{matrix}\right\}O$. If half the hydrogen in this typical formula be replaced by an organic radical, such, for example, as C_nH_{2n+1}, C_nH_{2n-1}, C_nH_{2n-3}, C_nH_{2n-7}, or C_nH_{2n-9} (*n* being any number), we obtain what is termed a monatomic alcohol, *one* equivalent of hydrogen being here replaced. Besides the primary water-type represented by one molecule of water, there are alcohols derived from double and triple types, represented by two and by three molecules of water, and expressed in the forms $\left.\begin{matrix}H_2\\H_2\end{matrix}\right\}O_2$ and $\left.\begin{matrix}H_3\\H_3\end{matrix}\right\}O_3$. If half the hydrogen in $\left.\begin{matrix}H_2\\H_2\end{matrix}\right\}O_2$ be replaced by an organic radical, we obtain an alcohol said to be *diatomic*, in consequence of its being formed by the replacement of two equivalents of hydrogen. Similarly, if half the hydrogen in $\left.\begin{matrix}H_3\\H_3\end{matrix}\right\}O_3$ be replaced by an organic radical, we obtain a triatomic alcohol. The term *polyatomic* is applied to all alcohols which are not monatomic.

POLYBA'SIC ACIDS. The basicity of an acid is a term used to denote the number of hydrogen atoms it contains capable of being replaced by a metal to form a salt. Thus nitric acid, HNO_3, contains only one such hydrogen atom and is *monobasic;* it can form but one nitrate of a metal (example sodium nitrate $NaNO_3$).

Sulphuric acid, H_2SO_4, contains two replaceable hydrogen atoms, and is *bibasic* or *dibasic.* If one of its hydrogen atoms be substituted by a metal the result is an *acid* salt (example acid sodium sulphate $NaHSO_4$). If both hydrogen atoms are substituted, a *normal* or *neutral* salt is produced (example normal sodium sulphate Na_2SO_4).

Ortho phosphoric acid, H_3PO_4, is *tribasic* and can form three salts with a metal, one normal and two acid, thus normal sodium phosphate, Na_3PO_4, hydrogen disodium phosphate, Na_2HPO_4, and dihydrogen sodium phosphate, NaH_2PO_4. Other examples might be given showing acids of still higher basicity.

Amongst the organic acids a similar relation takes place, acetic, succinic, and citric acids affording examples of the monobasic, dibasic, and tribasic class. The name *polybasic* is given to all acids not monobasic.

The following are the most important general differences shown by acids of different degrees of basicity:

1. Each *monobasic* acid can form but *one* ether, which is neutral. 2. A *monobasic* acid cannot form a stable, well-defined acid salt or a salt with two or more metallic bases.

1. Each *dibasic* acid can form *two* ethers, one neutral, and the other acid. 2. *Dibasic* acids can form with each metallic base a neutral salt and an acid salt. They can also form double salts containing two metallic bases.

1. Each *tribasic* acid can form *three* ethers, one neutral, and two acid. 2. *Tribasic* acids can form *three* salts with the same metallic base, two of them acid and one neutral.

Many attempts have been made to account for the polybasic or monobasic character of an acid, from its composition. According to Kekulé (*Lehrbuch der Organisch. Chemie*, vol. i. p. 210–219), the basicity depends not, as was formerly supposed, on the molecular constitution of the acid, but upon the amount of oxygen contained in its radical. For further details on this subject, the reader is referred to the article ACIDS in Watt's *Dictionary of Chemistry*, vol. i. 1863.

POLYBIUS, the Greek historian, was born about 204 B.C. in Megalopolis, a town of Arcadia. From Lycortas, his father, who was among the leading men of the Achæan league, he received valuable instruction in the science of politics and in the art of war. In 181 he would have visited Egypt in the capacity of ambassador, but the project of sending an embassy to that country was given up. His engaging in public affairs probably dates from this period, and he rapidly gained the confidence of his countrymen. He was one of the 1000 noble and influential Achæans who, after the conquest of Macedonia in 168, were sent to Rome on the summons of the commissioners from that city to answer the charge of having failed to assist the Romans against king Perseus. On their arrival in Italy in 167 they were not put upon their trial, but were distributed among the towns of Etruria. Owing, perhaps, to his having formed the friendship of Æmilius Paulus, or of his sons Fabius and Scipio, he was more fortunately allocated than others of his countrymen. His residence was fixed at Rome and in the house of Paulus. Scipio, then about 18 years of age, became strongly attached to Polybius, made him his companion in all his military expeditions, and profited greatly by his knowledge and experience. Polybius in his turn derived much advantage from the protection and friendship of Scipio, who gave him access to public documents, and aided him in the collection of materials for his great historical work. In 151 the surviving Achæan exiles were permitted by the Roman senate to return to Greece, and among them was Polybius, who arrived in Peloponnesus after a residence of 17 years in Italy. He soon, however, rejoined Scipio, followed him in his African campaign, and was present at the destruction of Carthage in 146. But the outbreak of war between the Achæans and Romans summoned him again to Greece, where he arrived soon after the taking of Corinth. All his influence was now exerted to procure from the conquerors favorable terms for the vanquished; and so grateful were his countrymen for his services in their behalf, that they erected statues in his honor at Megalopolis (his native town), Mantinea, Pallantium, Tegea, and other places. It must have been about this time that Polybius undertook the writing of his great historical work, the materials of which he had so long been collecting. We cannot now fix with accuracy at what period of his life he visited in foreign countries the places which he had to describe in his history. We know from himself that at one time, probably while accompanying Scipio, he undertook long and laborious journeys into Africa, Spain, Gaul, and even as far as the shores of the Atlantic, in order to add to the scanty knowledge previously existing with regard to these regions. In the latter period of his life he traveled in Egypt; and about 12 years before his death, he probably accompanied Scipio to Spain, where he witnessed the fall of Numantia. He died about 122 B.C., in his 82d year, in consequence of a fall from his horse.

As a historian Polybius occupies a high rank. His work, which began where that of Aratus broke off, includes the period between 220 and 146 B.C., the year when Corinth fell, and, with it, the independence of Greece. Of the two parts into which it was divided, the first embraced a period of 53 years, commencing with the second Punic war and the social war in Greece, and concluding with the subjugation of the kingdom of Macedonia in 168. This, the chief portion of his history, was designed to show how, in the short space of 53 years, the greater part of the world had been conquered by the Romans; and in order that his countrymen might have a better knowledge than they possessed of the rise of that people, he gives a sketch of the history of Rome from its capture by the Gauls to the outbreak of the second Punic war. This occupies the first two books, and may be regarded as an introduction to the work. The second part embraces the period from the fall of the Macedonian kingdom, in 168, to the taking of Corinth in 146. This part is to be viewed as supplementary to the first, and seems to have brought down the history of the conquest of Greece to its completion in the 39th book, while the 40th and last probably contained a chronological summary of the entire work. The style of Polybius is not his most striking feature, and he incurred the censure of later Greek critics for his negligence in the choice of words and in the structure of his sentences. His great merits are the care with which he collected his materials.

his strong love of truth, and his sound judgment, which was materially assisted by his familiarity with political and military life. His tone is too didactic in general, and although his readers are prepared for this by his calling his work not a *Historia*, but a *Pragmateia*, still the continuity of the narrative is too often interrupted by digressions, sometimes interesting and valuable in themselves, but fatal to artistic effect. Much the greater part of his work has perished. Of the 40 books, we possess only five entire; and of the rest, merely fragments or extracts. Some of these latter, however—such as the account of the Roman army—are of considerable length and value, and four separate collections of them have been added from time to time to the remains of the work. The first of these, discovered soon after the revival of learning, in a MS. of Corfu, gives us the greater part of the 6th book, and portions of the remaining 11. The second consists of extracts made in the 10th c., entitled *Excerpta de Legationibus*, and published at Antwerp by Ursinus in 1582. The third, entitled *Excerpta de Virtutibus et Vitiis*, was published in 1634 by Valesius. The fourth, entitled *Excerpta de Sententiis*, was discovered by cardinal Mai in the Vatican, and published by him at Rome in 1827. The history of Polybius was very closely followed by Livy after the period of the second Punic war, and by Cicero in his account of the Roman constitution in his treatise *De Republicâ*.—The best annotated edition of Polybius is Schweighäuser's (Leip. 1789). The best editions of the text, including that of the Vatican fragments, are those of Bekker (Ber. 1844) L. Dindorf (1866); and Shuckburgh (1888).

POLYCARP, Bishop of Smyrna, and one of the most illustrious of the early Christian martyrs, was born in the latter part of the 1st c. A.D., but neither the date nor the place of his birth is known. He was, however (according to a legendary fragment ascribed to an unknown Pionius), brought up at Smyrna, where his pupil, Irenæus, states that Polycarp was taught the doctrines of Christianity by the apostles, particularly by John, with whom he had "familiar intercourse." The testimony of Irenæus on this point is of immense value, as it furnishes the chief historical link uniting the apostolic age—that age which is reflected in the later parts of the New Testament—with the rising church of the 2d century. The passage occurs in an expostulatory epistle to a Roman heretic, Florinus, and is preserved by Eusebius (*Hist. Eccl.* chap. xx.). "I can tell also the very place where the blessed Polycarp was accustomed to sit and discourse; and also his entrances, his walks, the complexion of his life, and the form of his body, and his conversations with the people, and his familiar intercourse with John, as he was accustomed to tell, and also his familiarity with those that had seen the Lord. Also concerning his miracles, his doctrines, all these were told by Polycarp, in consistency with the holy Scriptures, as he had received them from the eye-witnesses of the doctrine of salvation." The fragment of Pionius (to which reference has already been made) informs us that Polycarp, when only a little child, was adopted by a rich Christian lady named Callisto, who left him heir to all her wealth; in consequence of which he was enabled to gratify his love of works of beneficence and charity. We are, however, utterly without the means of determining what truth (if any) there is in the narrative of Pionius, and can only feel certain that in some way or other he had distinguished himself at a comparatively early period, for before the death of the apostle John (i.e., at the latest, before 104 A.D.), he was ordained bishop of Smyrna (according to Tertullian and Jerome) by John himself; according to Irenæus, by "the apostles;" and according to Pionius, by "the bishops of the neighboring churches"—statements which are quite reconcilable with each other. Polycarp was in the exercise of his episcopal functions when Ignatius of Antioch passed through Smyrna on his road to Rome (107–16 A.D.), and we are told that the two pupils of St. John, who had probably known one another in earlier years, had much delightful Christian converse. Almost half a century afterward Polycarp himself visited Rome, when Anicetus was bishop there (157–68 A.D.), and had a friendly conference with his brother on the subject of the proper time to hold Easter. They could not agree—but they agreed to differ. His martyrdom, which is related at great length and in a touching manner by Eusebius (*Hist. Eccl.* chap. xiv.), took place probably in 166 A.D., during the persecution under the emperors Marcus Aurelius and Lucius Verus. When asked, or rather entreated "to revile Christ" by the proconsul Statius Quadratus, who, being deeply impressed with the venerable appearance of the aged bishop, wished if possible to save his life, Polycarp replied, "Eighty-and-six years have I served Him, and He never did me wrong; and how can I now blaspheme my King that has saved me?" Polycarp was burned alive. In such profound reverence was he held by his fellow-Christians, for his almost perfect graces of character, that the Jews (who had been conspicuously zealous in collecting "wood and straw from the shops and baths" to burn him) instigated the proconsul not to give up the corpse of the martyr to his co-religionists, "lest, abandoning Him that was crucified, they should begin to worship this one." More convincing evidence of a saintly character has never been adduced.

Polycarp wrote several *Epistolæ*, of which only one has been preserved, the *Epistola ad Philippenses*, valuable for its numerous quotations from the New Testament—especially from the writings of Paul and Peter. It is, however, doubtful whether this epistle is really by Polycarp. In the most recent edition of the Apostolic Fathers (*Patrum Apostolicorum Opera*, Leipsic, 1877), Prof. Zahn defends its genuineness. There are English versions by Cave, Clementson, and Wake.

POLYCHROME PRINTING, the art of printing in one or more colors at the same time. Although several attempts had been previously made to carry out this process, Congreve, in 1820, was the first to do it successfully with metal plates. Sir William Congreve had seen Applegath's polychromatic block-printing press, by which very rude colored pictures were produced, and he conceived the idea of improving upon it, and doing it with metal. His plan is extremely simple, though requiring great nicety in carrying it out. First, the picture is outlined upon a metal plate; and supposing it intended to have two colors, then the details of only the chief color are completed upon it, and all the parts for the other color are cut out, and into those parts other plates are fitted, like the portions of a child's puzzle-map, but with very great exactness; and upon these the engraving for the parts of the second color are completed. When these are done, a thickness of type-metal is attached to the back of these interior pieces, so that they can be held separately, and pushed forward or drawn backward at pleasure. Then they are so adjusted to the machinery of the press, that they are withdrawn when the first color-roller passes over the surface of the main plate, and are pushed forward beyond the face of the main plate, so as to receive the color of the second roller, which then passes over them without touching the first or main plate. Having received their colored ink, the secondary plates are again moved back to a perfect level with the other, so as to form an entire plate, carrying two colors, which are thus, in the ordinary way, imprinted on the paper. Since sir William Congreve's patent very many improvements have been made, the principle, however, remaining the same, and it has now a very wide application.

POLYCLÉTUS, a Greek sculptor and architect, supposed to have been b. at Sicyon about 430 B.C., and a citizen of Argos. He is said to have been the pupil of Argive Agelādas, who was also the instructor of Phidias and Myron. His greatest work is thought to be the statue of "Hera," in the temple, between Argos and Mycenæ, carved in ivory and gold. The goddess is represented on a golden throne, crowned with a garland on which are cut the graces and hours, and holding the scepter surmounted by a cuckoo in one hand, and a pomegranate in the other. The upper portion of the figure and the feet are of ivory, the robe of gold, falling from the waist. Polyclétus probably intended this statue to surpass the chryselephantine statues, "Athena" and "Zeus," the works of Phidias, and though it equaled them in beauty, it was exceeded by them in size. His celebrated statue, the "Spear-bearer," was considered the canon for students on account of its fine symmetry. He designed the theater at Epidaurus, thought to be the most beautiful of all theaters, whether Greek or Roman, and was considered the greatest architect of his time. Phidias, it is said, was unrivaled in his images of gods; Polyclétus in his images of men. He was the author of a treatise on the proportions of the human body Nothing is known of his personal history.

POLYCOTYLED'ONOUS PLANTS, those plants of which the embryo has more than two seed-lobes or cotyledons. See Botany and Dicotyledonous Plants. In some of the *coniferæ* in particular, there are numerous cotyledons; the genus *pinus* has from three to twelve. These cotyledons are placed in a whorl, and have the gemmule of the embryo in the midst of them. Polycotyledonous plants do not form a separate division of the vegetable kingdom, but are ranked with the dicotyledonous plants; for plants with two, and plants with more cotyledons are found not only in the same natural order, but in the same genus.

POLYC'RATÉS, "tyrant" of Samos, is a well-known name in ancient Greek history. He was b. in the first part of the 6th c. B.C., but nothing is known of him until the time when, with the assistance of his brothers, Pantagnôtus and Sylosôn, he obtained possession of the island. The three brothers at first ruled conjointly, but after a short time, Polycratés put Pantagnôtus to death, banished Sylosôn, and made himself sole despot. His energetic, unscrupulous, and ambitious character now showed itself more conspicuously than ever. He conquered several islands of the Archipelago, and even some towns on the Asiatic mainland, waged war successfully against the inhabitants of Milêtus, and defeated their allies, the Lesbians, in a great sea-fight. His fleet amounted to 100 ships, and was probably at that time the most powerful in all Greece. Polycratés seems to have aspired to the sovereignty of the Ægean, if not also of the cities of Ionia. His intimate alliance with Amasis, king of Egypt, proves the importance in which this daring island-prince was held even by great monarchs. According to Herodotus, Amasis drew off from his alliance through alarm at the uninterrupted good fortune of Polycratés. He dreaded, we are told, the misfortunes that the envious gods must be preparing for so lucky a mortal, and to which his friends would also be exposed. The particular incident that is said to have finally ruptured the alliance is doubtless mythical, but is so well known that we cannot afford to overlook it. Amasis is reported to have written a letter to Polycratés, earnestly advising him to throw away the possession that he deemed most valuable, and thereby avert the stroke of the spleenful gods. Polycratés, in compliance with this friendly advice, cast a signet-ring of marvelously beautiful workmanship into the sea; but next day a fisherman presented the "tyrant" with an unusually big fish that he had caught, and in its belly was found the identical ring. It was quite clear to Amasis now that Polycratés was a doomed man, and he immediately broke off the alliance. So, at least, Herodotus tells the story; but Grote (*History of Greece,* vol. iv.

p. 323) suggests—and the suggestion is far more probable—that Polycratés, with characteristic perfidy, abandoned the Egyptian for a Persian alliance when he found the latter likely to be of more value to him in his ambitious designs. When Cambyses invaded Egypt (525 B.C.), Polycratés sent him a contingent of forty ships, in which he placed all the Samians disaffected toward his "tyranny," and told the Persian king privately not to let them come back! However, they escaped in some way or other the fate which Polycratés had designed for them, returned to Samos, and made war against the "tyrant," but without success. Hereupon, they went to Sparta, and succeeded in enlisting the sympathies, or, at any rate, in securing the help of both the Spartans and Corinthians. A triple force of Samians, Spartans, and Corinthians embarked for Samos, and attacked the city. After vainly besieging it for forty days they sailed away, and Polycratés now became more powerful than ever; but Nemesis had her victim after all. A certain Orœtes, the Persian satrap of Sardis, had, for unknown reasons, conceived a deadly hatred against Polycratés, and having enticed the latter to visit him, by appealing to his cupidity, he seized and crucified him. Thus perished ignominiously, in the midst of his power and splendor, one of the most famous *thalassokrats*, or sea-kings, of Greek antiquity. He was a patron of literature and the fine arts, and had many poets and artists about his court. His intimacy with Anacreon, in particular, is quite a celebrated thing, and in his praise that joyous bard wrote many songs. To Polycratés also, in all probability, belongs the construction, or at least the enlargement, of those great buildings which Herodotus saw at Samos.

POLYDIPSIA (Gr. *great thirst*) is the term now commonly applied to the disease formerly known as *diabetes insipidus*. It is characterized, as its name implies, by extreme thirst, and by an enormous discharge of pale watery urine. The affection is one of rare occurrence, and the persons most liable to it are dyspeptics who have passed the period of middle life, and whose bodily powers are failing, although (as the case we shall immediately notice, and one recorded by Dr. Watson, show) it may begin in childhood. The two prominent features of this disease usually lead to the suspicion that true diabetes is present; but the low specific gravity of the urine, and the absence of sugar in it in polydipsia, and the reverse condition in diabetes, seem to make the distinction easy. Dr. Willis, in his work *On Urinary Diseases*, records the case of a man, aged 45, who was admitted for an accident into the Hôtel-Dieu at Paris, and who passed daily, on an average, thirty-four pounds of urine, and drank thirty-three pounds of water, the normal daily excretion of urine being a little less than two pounds. This person reported that he had been affected in a similar manner ever since his fifth year, and that, from the age of 16 upward, he had daily consumed not less two bucketfuls of water, and discharged a commensurate quantity of urine. Little good can be affected by treatment, further than stimulating the action of the skin by the use of Dover's powders, Turkish baths, etc., and by inducing the patient to take as little drink as may be at all consistent with his comfort.

POLYGALEÆ, or POLYGALACEÆ, a natural order of exogenous plants, herbaceous or shrubby, sometimes twining; the leaves without stipules, and generally simple; the flowers resembling papilionaceous flowers, but the odd petal inferior, and the odd sepal superior; the flower-stalks with three bracts; the calyx of five very irregular sepals; of which the two interior are usually petal-like; the corolla of three, or sometimes five petals, the anterior petal the largest, and often crested; stamens eight, monadelphous or diadelphous, or four and distinct; the ovary superior, generally 2-celled, one ovule in each cell; style and stigma simple; fruit generally a capsule opening by valves, sometimes a drupe. There are about 500 species, diffused throughout all parts of the world.—The genus *polygala* has a persistent calyx, eight stamens, the lateral sepals large and petal-like, and hairy or wrinkled seeds. The species are very numerous, annual and perennial herbaceous plants, and small shrubs, natives chiefly of warm and temperate climates. One is found plentifully in Britain; the COMMON MILKWORT (*P. vulgaris*), a small perennial plant, growing in dry hilly pastures; with an ascending stem, linear-lanceolate leaves, and a terminal raceme of small but very beautiful flowers, having a finely-crested keel. It varies considerably in size, in the size and even shape of the leaves, and in the size and color of the flowers, which are sometimes of a most brilliant blue, sometimes purple, pink, or white.—Several species are natives of the south of Europe.—North America produces a greater number. The cape of Good Hope and other subtropical countries produce many beautiful species, some of which have become common ornaments of greenhouses.—*P. senega* is a North American species, with erect simple tufted stems, about 1 ft. high, and terminal racemes of small white flowers. The root, which is woody, branched, contorted, and about half an inch in diameter, is the SENEGA ROOT, SENEKA ROOT, or SNAKE ROOT of the United States, famous as an imaginary cure for snake-bites, but really possessing important medicinal virtues—stimulating, diuretic, diaphoretic, emmenagogue, and in large doses emetic and purgative—employed in catarrhs, pulmonary affections, rheumatisms, low fevers, etc. Its chief active principle is *polygalic acid*, $C_{22}H_{18}O_{11}$. The root of *P. senega* has been employed as a cure for snake-bites by the American Indians from time immemorial, and it is a curious fact, that *P. crotalarioides* is employed in the same way in the Himalaya. *P. vulgaris* is tonic, stimulant, and diaphoretic; and *P. amara*, a very similar European species, possesses

the same properties in a higher degree, as does *P. rubella*, a small North American species. The root of *P. poaya*, a Brazilian species, with leathery leaves, is an active emetic, and in a fresh state, is employed in bilious fevers. Similar properties seem to pervade the whole genus. Another medicinal plant of the order is *rattany* (q.v.) *root.* Species of several genera are used as tonics. The bark of the roots of *monnina polystachia* and *M. salicifolia* is used in Peru as a substitute for soap. *Mundia spinosa*, a s. African shrub, produces an eatable fruit.

POLYGAMOUS (Gr. *polys*, many, *gamé*, marriage), in botany, a term employed to designate those plants which produce both unisexual and hermaphrodite flowers either on the same or different plants. In the Linnæan sexual system these plants formed a class, POLYGAMIA, the genera included in which were perhaps more completely disjoined from their natural allies than those of any other class of that system, forming by themselves a very heterogeneous assemblage.

POLYGAMY. See MARRIAGE.

POLYGASTRICA. See INFUSORIA.

POLYGLOT (Gr. *polys*, many; and *glōtta*, tongue) means, in general, an assemblage of versions in different languages of the same work, but is almost exclusively applied to manifold versions of the Bible. The Hexapla (q.v.) of Origen contained, besides the Hebrew text, several other versions. All these, however, were in the Greek language, and the Hexapla is not commonly reckoned among the polyglots. They are divided into two classes, the greater and the lesser polyglots. To the former belong four works, known as the Complutensian Polyglot; the Antwerp, or king of Spain's Polyglot; the Parisian Polyglot, and the London or Walton's Polyglot.—The Complutensian Polyglot derives its title from Complutum, the Latin name of Alcala de Henares, where it was printed in 6 vols. folio, 1502–1517. It was published at the cost, and under the direction of the celebrated Cardinal Ximenes, who spared no expense, whether in collecting the most ancient and authentic MSS., or in bringing together the most distinguished scholars of all countries for the carrying out of his design. The Complutensian Polyglot contains, besides the Hebrew text, the Septuagint Greek and the Chaldee (each with a literal Latin version), and the Latin Vulgate.—The Antwerp Polyglot, so called from its being there printed (1569–72), at the celebrated press of Plantin, was published at the cost of Philip II. of Spain, under the direction of the distinguished scholar, Benedict Arias Montanus. It is in 8 vols. folio, and contains, in the Old Testament, the Hebrew, the Greek, the Targum of Onkelos, and the other Chaldee paraphrases, and the Latin Vulgate. In the New Testament, besides the Greek and Latin, it contains a Syriac version, printed both in Syriac and in Hebrew characters. Arias Montanus was assisted by many scholars of eminence, chiefly of Spain and the Low Countries.—The Parisian Polyglot was printed at Paris in 1645, at the cost and under the editorship of Guy Michel le Jay. It is in 10 splendid volumes, and contains, in addition to the contents of the Antwerp Polyglot, another Syriac version, and an Arabic version, together with the Samaritan version and the Samaritan text of the Pentateuch, each of these being accompanied by a literal Latin translation.—The London Polyglot was edited by Brian Walton, afterward bishop of Chester, and it engaged for many years a number of the most eminent linguists of the period. The number of its languages is not the same in all parts of the Bible; but it may be said to contain the Bible, or portions of it, in nine languages: Hebrew, Samaritan, Chaldee, Syriac, Arabic, Ethiopic, Persic, Greek (each of these accompanied by a literal Latin version), and Latin. It is in 6 vols. folio, and was published in 1654–57; and was followed in 1669 by the *Lexicon Heptaglotton* of Edmund Castell, 2 vols. folio, containing dictionaries of all the languages of the polyglot, except the Greek and Latin. Of the minor polyglots the chief are (1) the Heidelberg Polyglot (1586), Hebrew, Greek, and Latin; (2) Wolder's Polyglot (Hamburg, 1596), Hebrew, Greek, Latin, and German; (3) Hutter's Polyglot (Nürnberg, 1599), Hebrew, Chaldee, Greek, Latin, German, and French; (4) Reineccius's Polyglot, in Syriac, Greek, Latin, and German (Leipsic, New Testament, 1712; Old Testament, 1750, 1751); (5) Bagster's Polyglot, a very valuable collection of modern versions, folio (London, 1831). It contains 8 versions in the Old Testament, viz., Hebrew, Greek, English, Latin, French, Italian, Spanish, and German; and 9 in the New, Syriac being added to those already named. (6) A useful "Hand Polyglot," containing in the Old Testament, Hebrew, Greek, Latin, Vulgate, and Luther's German version; and in the New, Greek, Latin, Luther's German, and in the fourth column, in which are presented the chief differences between this and other German versions.

Besides the Bible, many other works, or small pieces, have been published in polyglot. Of smaller pieces, the Lord's prayer has been the favorite, of which many collections, containing a greater or less number of languages, have been published from the 16th c. downward. Of these, the most comprehensive, and, for philological purposes, by far the most valuable, is the well-known *Mithridates* of Adelung, which contains the Lord's prayer in nearly 500 languages, with vocabularies and grammatical explanations of most of the specimens.

POLYGNOTUS, a distinguished Greek painter of antiquity, was b. toward the beginning of the 5th c. B.C. He was a native of the isle of Thasos, and belonged to a family

of painters, who came to Athens to practice their profession, probably after the subjugation of Thasos by Cimon. Polygnotus and his brother, Aristophon, were instructed in the principles of art by their father, Aglaophon. We know almost nothing of their lives, except that Polygnotus was a friend of the Athenian general above mentioned, and is said to have been attached to his sister, Elpinice. He died about 426 B.C. Polygnotus was a contemporary of the great sculptor Phidias (q.v.), and flourished during the supremacy both of Cimon and Pericles; but we hear little or nothing of him under the latter ruler; and although the first painter of his day, it does not appear that he was engaged in the decoration of any of those splendid buildings with which that statesman adorned Athens. It is not at all unlikely that Pericles was averse to patronizing a friend of Cimon, and, at all events, Polygnotus was absent from Athens for 14 years (449–435 B.C.) of Pericles's rule, painting at Delphi and elsewhere. His principal works (following a chronological arrangement as far as it can be ascertained) were: 1. Paintings in the temple of Theseus at Athens. 2. In the stoa poecile (or painted portico) at Athens, representing the Greek princes after the taking of Troy, assembled to judge of the violation of Cassandra by Ajax. 3. In the anakeion, or temple of the Dioscuri, a painting of the marriage of the daughters of Leucippos. 4. In the temple of Athena Areia at Platæa, a picture of Ulysses after having slain the suitors of Penelope. 5. In the leschê (or "conversazione saloon"), a famous quadrangular court, or peristyle, surrounded by colonnades, built at Delphi by the Cnidians. The walls of this edifice were covered by Polygnotus with a series of paintings representing the wars of Troy, and the return of the Greek chiefs, and considered Polygnotus's masterpiece. 6. In the chamber adjoining the propylæa of the acropolis. From the criticism of the ancients, it seems quite clear that Polygnotus was a great advance on any of his predecessors. He was the first who gave life, character, expression to painting. According to Pliny, he opened the mouth and showed the teeth of his figures; he was the first to paint women with transparent drapery, and with rich head-dresses. Lucian also speaks of his exquisite skill in painting eyebrows and the blush on the cheek; while Aristotle extols the ethical or ideal beauty of his conceptions, saying that Polygnotus "represented men as better than they were," and finding a parallel for his style in the epic poetry of Homer.

POL'YGON (Gr. *polys*, many; *gōnia*, a corner), a plane figure, bounded by a number of straight lines; the name is conventionally limited to those plane figures whose bounding straight lines are more than *four* in number. Polygons of 5, 6, 7, 8, etc., sides are denominated pentagons, hexagons, heptagons, octagons, etc.; and when the number of sides exceeds twelve, the figure is merely mentioned as a polygon of so many sides. The quindecagon, or figure of 15 sides, is the only common exception to this rule. Polygons have many general properties; such as that the sum of the angles of a polygon, when increased by four right angles, or 360°, is equal to twice as many right angles as there are sides in the polygon, and that (supposing the number of sides of the polygon to be expressed by n) the number of its diagonals is $\frac{n(n-3)}{2}$; also if a polygon of an even number of sides be circumscribed about a circle, the sums of its even and odd sides are equal; and if a polygon of an even number of sides be inscribed in a circle, the sums of its even and odd angles are equal. A polygon which has all its sides and angles equal is called a *regular* polygon. All polygons of this class are capable of being inscribed in or circumscribed about a circle; but though the problem is merely to divide the circumference of a circle into a number of equal parts, corresponding to the number of sides in the polygon, geometry was till lately only able to perform it in those cases where the number of sides of the polygon belongs to one or other of the series 2, 4, 8, 16, etc.: 3, 6, 12, 24, etc.; or 5, 10, 20, 40, etc. Gauss (q.v.), however, in the beginning of the present century, showed how it could be done in the case of all polygons, the number of whose sides was of the form $2^n + 1$ (provided it be a prime number), or a multiple of this prime number by any power of 2. This discovery supplies us with innumerable series representative of the numbers of the sides of polygons which can be described around or inscribed in a circle, such as 17, 34, 68, etc.; 257, 514, 1028, etc.

POLYGO'NEÆ, or POLYGONA'CEÆ, a natural order of exogenous plants, mostly herbaceous plants, but including a few shrubs, and even trees. The leaves are alternate, sometimes without stipules, but more generally with stipules cohering around the stem. The flowers are not unfrequently unisexual. They have an inferior, often colored perianth, generally in four, five, or six segments; three to nine stamens inserted into the bottom of the perianth; a one-celled ovary, usually formed of three carpels, but containing only one ovule; styles and stigmas as many as the carpels of the ovary; the fruit generally a nut, often triangular, the seed with farinaceous albumen, which has an economic importance in buckwheat. A few species produce a succulent edible fruit. The order contains nearly 500 known species, natives of almost all parts of the world, but particularly abundant in the temperate regions of the northern hemisphere. Many of the species are common weeds in Britain, as different species of dock (q.v.) and *polygonum*. Bistort (q.v.), buckwheat (q.v.), and sorrel (q.v.) belong to this order.—The genus *polygonum* has a colored perianth of five segments, stamens in two rows, styles more or less united at the base, and two or more in number; the fruit invested by the

persistent perianth. The species are very numerous. A number are natives of Britain. Knot-grass (*P. aviculare*), a very common British weed, is one of the plants remarkable for most extensive distribution over the world. It is an annual of very humble growth, but very variable, with much branched trailing stems, small lancelate leaves, and very small flowers, two or three together, in the axils of the leaves. Thunberg says that in Japan a blue dye is prepared from the plant. *P. amphibium*, one of the species often called *persicaria*, is abundant about margins of ponds and ditches in Britain and throughout Europe, and is remarkable for the difference between the leaves which float on the water, as is often the case, and those on stems growing erect, those of the former being broad and smooth, those of the latter narrow and rough; the spikes of flowers being also of somewhat different form, and the stamens in the flowers of the floating stems shorter than the perianth, in the upright stems about as long as the perianth; differences which might be held to indicate different species, yet both may be found growing from one root. The stems have been used on the continent of Europe as a substitute for sarsaparilla. Some other species are occasionally used for medicinal purposes. *P. hydropiper*, often called Water Pepper, common by lakes, is acrid enough to be used as a vesicant. See illustration, Botany, vol. II., fig. 36. Several species are occasionally used for dyeing, as the Spotted Persicaria (*P. persicaria*), a very common weed on dunghills and in waste places in Britain; but the only species really important on this account is that called Dyers' Buckwheat (*P. tinctorium*), a native of China, biennial, with ovate leaves and slender spikes of reddish flowers, the cultivation of which has been successfully introduced in France and Flanders. It yields a blue dye scarcely inferior to indigo. See Calligonum.

POLYGON OF FORCES. By the application of a law discovered by Galileo, and graphically represented by the parallelogram of forces, the resultant of two forces acting upon a single point may readily be determined. When more than two forces act on the same point a single resultant may still be found by a further application of this principle, considering the resultant of any two forces as a new force of which the resultant with any other force is to be determined, and so on. If the final resultant is zero, the point is already in equilibrium. If not zero, it stands for the additional force necessary to hold the point in equilibrium when acted upon by the combined forces.

A polygonal figure, whose sides, taken successively, represent, in length and direction, the acting forces, and the side necessary to complete the figure—if incomplete the resultant—is *the polygon of those forces.*

POLYHYMNIA, or Polymnia ("the many-hymned one"), one of the nine muses (q.v.). She was reputed by the ancients to be the inventress of the lyre, and to preside over lyric poetry and eloquence. In works of art she is usually represented in a pensive attitude, with the forefinger of the right hand upon the mouth.

POLYMERISM, a form of Isomerism (q.v.).

POLYNE'MUS and **POLYNEMIDÆ.** See Mango Fish.

POLYNE'SIA, or the region of many islands (Gr. *polys*, much or many, and *nesos*, an island), is the name usually given, with more or less of limitation, to the numerous groups of islands, and some few single islands, scattered throughout the great Pacific ocean, between the eastern shores of Asia and the western shores of America. In its widest signification, the term Polynesia might be understood as embracing, besides the groups hereafter to be mentioned, the various islands, large and small, of the Indian archipelago, in one direction; and the vast island of New Holland or Australia, with its dependency of Van Diemen's land, in another. Including these, the whole region has sometimes been called Oceania, and sometimes Australasia—generally, however, in modern times, to the exclusion of the islands in the Indian archipelago, to which certain writers have given the name of Malaysia. In proportion, also, as the area of maritime discovery has become enlarged, it has been thought convenient by some geographers to narrow still further the limits of Polynesia to the exclusion of Australia and Van Diemen's land; while others, again, exclude Papua or New Guinea, New Ireland, Solomon's isles, the Louisiade group, the New Hebrides, New Caledonia, and certain other groups and single islands, together with New Zealand, from the area of Polynesia, and give to these, in union with Australia, the collective designation of Australasia. To all these, with the exception of New Zealand, French writers have given the name of *Melanesia* or the *Black Islands*.

Thus we have the three geographical divisions of Malaysia, Australasia, and Polynesia, the last mentioned of which embraces all the groups and single islands not included under the other two. Accepting this arrangement, still the limits between Australasia and Polynesia have not been very accurately defined; indeed, scarcely any two geographers appear to be quite agreed upon the subject; neither shall we pretend to decide in the matter. The following list, however, comprises all the principal groups and single islands not previously named as coming under the division of Australasia: viz., 1. North of the equator—The Ladrone or Marian islands, the Pelew islands, the Caroline islands, the Radack and Ralick chains, the Sandwich islands, Gilbert's or Kingsmill's archipelago, and the Galapagos. 2. South of the equator—The Ellice group, the Phœnix and Union groups, the Fiji islands, the Friendly islands, the Navigator's islands, Cook's or Harvey islands, the Society islands, the Dangerous archipelago, the Marquesas islands, Pitcairn island, and Easter island.

These islands, which extend from about 20° n. of the equator to about 30° s. of it, are some of them volcanic in their origin, and some of them coraline. The volcanic islands generally rise to a considerable height above the level of the ocean, and are therefore called the high islands, in contradistinction to the coraline or low islands. They consist of basalt and other igneous formations. Of these, the principal are the Friendly islands, one of which, Otaheite or Tahiti, has a mountain rising to the height of 7,500 ft.; the Marquesas islands, also very high; the Samoan or Navigator's islands; and the Sandwich islands, of which Owyhee or Hawaii possesses several both active and extinct craters, 11,000, 12,000, and even 14,000 ft. high. The Galapagos group, nearest of all to South America, are likewise of igneous origin, and have several still active craters. The remaining islands are for the most part of coraline formation.

The coral islands (q.v.) may be distinguished into three classes—namely, atolls or lagoon islands, barrier reefs, and fringing reefs. The atolls are rings of coral reefs, surrounding a basin of sea-water of considerable depth, which is inclosed within this area. Examples of these are found in the Caroline islands, the Dangerous archipelago, and several other groups. Barrier reefs differ from the atolls chiefly in the fact of their containing an island in their center, the island being separated from the reef by a body of deep water; while the reef is in some instances entirely converted into land, and in others the sea washes over it, except in certain portions which project above the level of the ocean. Barrier reefs occur among the Society islands, the Gambier islands, and many other groups. Fringing reefs are collections of coraline formation, which are found skirting the coasts of an island in the same manner as the barrier reefs, but without any interior deep water channel. They are found in almost all the groups. From the fact of some of these islands being undoubtedly volcanic, it has been argued that all were originally of the same character; those of coraline formation being based upon the crests of submarine volcanoes, over which the coral insects have for an indefinite series of years been engaged in rearing their limestone structures. In opposition to the volcanic theory, Dr. Darwin has propounded one of his own—namely, the *theory of subsidence*, which, after mature consideration, he believes to be the only one capable of explaining the various phenomena observable in the coral atolls, barrier reefs, and fringing reefs of the Pacific. All these he considers as being the production of saxigenous insects, working upward from the foundations of what were originally so many islands, erect above the surface of the ocean, but which during long ages have been in a state of gradual subsidence. With respect to the atolls, he states it as his belief, that the lagoon is precisely in the place which the top of a shoal, and, in other cases, the highest part of an island, once occupied. So soon as these have sunk to a depth of from 120 to 180 ft. below the surface, the coral insects (which it is agreed are never found at a lower depth) commence their operations, and these working on in countless myriads, the sunken island, or a portion of it, is in process of time again reared to the level of the surrounding sea. It would take too long to specify all the phenomena upon which Dr. Darwin has based this ingenious theory, especially those connected with what are called the fringing reefs. It must be mentioned, however, that paradoxical as such a theory may seem, it has received the hearty support of no less distinguished a geologist than sir Charles Lyell, who, in the early editions of his *Principles of Geology*, having held to the volcanic theory, has since abandoned it for that propounded by Dr. Darwin. Nor is this all; for, in the last edition of sir C Lyell's work, we find him mentioning with approval Dr. Darwin's "important generalization that the Pacific and Indian seas, and some of the lands which border them, might be divided into areas of elevation and areas of subsidence, which occur alternately. Mr. Murray, of the *Challenger* expedition, Semper, and other Germans reject this theory.

Of the islands generally, we need only further observe that, although situated within the tropics, the heat of the atmosphere is delightfully tempered by a succession of land and sea breezes. The soil is exceedingly fertile; and besides the vegetable productions found growing when the islands were first discovered by Europeans, it has given a welcome home to the orange, lemon, sugar-cane, guava, cotton, potato, melon, and other fruits and plants introduced by foreign visitants. The only native quadrupeds on any of the islands when first visited were pigs, dogs, and rats; but the ox, the sheep, the goat, and even the horse, have since been successfully introduced into many of the groups. The feathered tribes are numerous, likewise the insects, and the coasts everywhere abound with a vast variety of fish and crustacea, highly important as a matter of food to the inhabitants of those islands, which have few quadrupeds.

For a more particular description of the several groups, we refer to the distinct articles of Fijis, Friendly Islands, Sandwich Islands, etc.; and shall now proceed to speak of the inhabitants generally under the head

Polynesians.—This race of people, supposed at one time by certain writers to be of American origin, is now almost universally admitted to have a close affinity with the Malays of the peninsula and Indian archipelago, and hence is classified with them by Dr. Latham under his subdivision of *Oceanic Mongolidæ*. In physical structure and appearance, the Polynesians in general more nearly resemble the Malays than they do any other race, although differing from them in some respects, as, indeed, the natives of several of the groups also do from each other. In stature, they are generally taller than the Malays, and have a greater tendency to corpulence. In color, also, they more nearly

approach that of the Europeans. The hair is often waved or curling, instead of long and straight, and the nose is frequently aquiline. These differences, however, which may all have been produced by lapse of time and different conditions of existence, offer no barrier to the strong presumption, that at some long antecedent period these islands were colonized by Malay adventurers. The Malays are known at the present time to be expert and daring sailors, and in the 16th c. were so powerful at sea, that they had frequent naval combats with European fleets in the Indian archipelago. In 1573 the king of Acheen, with a powerful armament, attacked and destroyed three Portuguese frigates; and in 1582 the same king attacked Malacca with a fleet of 150 sail. At a later period—namely, in 1615, one of his successors attacked the same settlement with a fleet of 500 vessels of various sizes and 60,000 men. If this was their strength and enterprise at a comparatively modern period, may they not have been as enterprising, if not quite so powerful, in far more remote times? The distance between the more western groups of Polynesia and the eastern islands of the Indian archipelago is not so great but that it could have been easily overcome by a hardy race of sailors, even although their vessels may have not been so well constructed as in modern times; and the same reasoning holds good with respect to the other groups extending still further e., or still more to the n. or south. Each island or group, as it was attained, would only form a convenient point of departure in process of time for some other island or group more remotely situated. It is true that the affinities of language are not great between the Malays and the Polynesians; still, some affinity has been recognized by philologers; while in their manners and customs a strong resemblance has been shown to exist, as in the institution of caste, the practice of circumcision, the chewing of the betel-nut, and other things. Many other facts might be mentioned in favor of the theory of a Malay settlement, not only of Polynesia, but of the islands called Melanesia or Kelænonesia as well; the last mentioned being inhabited by a race almost identical with the Negritos or Pelagian Negroes of the Eastern archipelago. Dr. Latham, in treating of the Polynesians, divides them into two branches—viz., 1. The Micronesian branch, and 2. The proper Polynesian branch. His theory as to the probable line of migration is as follows: "The reason for taking the Micronesian branch before the proper Polynesian, involves the following question: What was the line of population by which the innumerable islands of the Pacific, from the Pelews to Easter island, and from the Sandwich islands to New Zealand, became inhabited by tribes different from, but still allied to, the Protonesian Malays? That line, whichever it be, where the continuity of successive islands is the greatest, and whereon the fewest considerable interspaces of ocean are to be found. This is the general answer *à priori*, subject to modifications from the counterbalancing phenomena of winds or currents, unfavorable to the supposed migration. Now, this answer, when applied to the geographical details regarding the distribution of land and sea in the great oceanic area, indicates the following line: New Guinea, New Ireland, the New Hebrides, the Fijis, and the Tonga group, etc. From hence, the Navigator's islands, the isles of the Dangerous archipelago, the Kingsmill and other groups, carry the frequently diverging streams of population over the Caroline islands, the Ladrones, the Pelews, Easter island, etc. This view, however, so natural an inference from a mere land and sea survey, is complicated by the ethnological position of the New Guinea, New Ireland, and New Hebrides population. These are *not* Protonesian, and they are not Polynesian. Lastly, they are not intermediate to the two. They *break*, rather than propagate the continuity of the human stream—a continuity which exists geographically, but fails ethnographically. The recognition of this conflict between the two probabilities has determined me to consider the Micronesian archipelago as that part of Polynesia which is most likely to have been first peopled, and hence a reason for taking it first in order." The islands comprised in the Micronesian branch are the Pelew islands, the Caroline islands, the Marian islands, and the Tarawan or Kingsmill group. In physical appearance the inhabitants of these groups more nearly resemble the Malays than is the case with the Polynesians proper. In person they are not so tall as the latter. Their language has numerous dialects, most of which would perhaps be unintelligible to the groups further s. and east. In religion they are pagans; but their mythology and traditions differ from those of the Polynesians proper. Neither is the custom of the taboo and the use of kawa so prevalent as they are found to be among the latter. The proper Polynesians, so called, are found in the Fiji islands, but not to the same extent as in the following—viz., the Navigator's or Samoan islands, the Society islands, and Friendly islands; also in the Sandwich islands, the Marquesas, the Dangerous archipelago, etc. In physical appearance, they are the handsomest and tallest of all the natives of the Pacific islands, with the exception, perhaps, of the New Zealanders or Maoris. The aquiline nose is commonly seen among them, and there are many varieties both of hair and complexion. Their face is generally oval, with largish ears and wide nostrils. In the islands nearest to the equator, the skin is said to be the fairest, and it is darker in the coral islands than in the volcanic. Their language is said to bear some affinity to the Tagala, and is split up into numerous dialects, all, however, to a great extent mutually intelligible among the several groups. Paganism, originally prevalent among all the groups, is becoming gradually extirpated through the efforts of the missionaries, principally English and American, as in the Samoan, Sandwich, and Society groups, where but few absolute pagans now remain. The superstition of the taboo, the

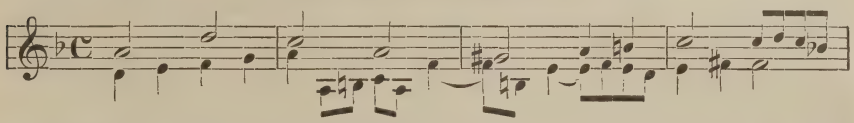
use of kawa as an intoxicating drink, cannibalism, infanticide, tattooing, and circumcision, which were also formerly prevalent in all the groups, are now fast disappearing, under the influence of Christianity. Unfortunately, however, the contact of these islanders with civilization has not been always productive of unmixed good; the introduction among them of the use of ardent spirits, and of the vices and diseases of Europeans, having thinned the population to a lamentable extent. Further particulars with respect to the natives of Polynesia will be found in some of our articles on the groups regarded as being the most important.

POLYNICES. See ETEOCLES.

POLYPHEMUS, a genus of *branchiopoda* (q.v.), of the order *cladocera*, remarkable for the extraordinary size of the solitary eye, which occupies almost the whole head. One species (*P. stagnorum*), is common in stagnant pools and ditches in some parts of Britain and of the continent of Europe. It is about the size of a flea, and moves rapidly in the water, executing all kinds of evolutions, employing both its legs and antennæ as organs of swimming. The shell, consisting of two pieces, is so transparent that all the viscera may be seen through it. The abdomen is terminated by a long tail suddenly folded back.

POLYPHEMUS, in the Homeric mythology, the son of Poseidôn and the nymph Thoosa, the most celebrated of the fabulous Cyclops (q.v.), who inhabited the island of Sicily. He was of immense size, and had only one eye. When Ulysses landed on that island, he entered the cave of Polyphemus with twelve companions, of which number this tremendous cannibal ate six. The others stood expecting the same fate, but their cunning leader made Polyphemus drunk, then burned out his single eye with a blazing torch, and so escaped, leaving the blinded monster to grope about in the darkness.

POLYPHON'IC (Gr. *polys*, many, and *phoné*, voice). When a musical composition consists of two or more parts, each of which has an independent melody of its own, it is said to be polyphonic, in opposition to a homophonic composition, consisting of a principal part with a leading idea, and accessory parts employed to strengthen it. Each part of a polyphonic composition aims at melodic perfection, and while supporting the other, has an equal share in the entire effect, as in the following example:



A fugue (q.v.) is the most perfect example of polyphonic composition. The difference between homophonic and polyphonic compositions is not always so marked as to leave it free of doubt whether a part is subordinate or independent; and many compositions consist of an alternation of homophonic and polyphonic passages. The construction of polyphonic phrases is called counterpoint.

POLYPI, or POLYPS, a class of animals which were, till the last few years, included in the RADIATA of Cuvier, but which, since the radiata have ceased to be regarded as a subkingdom, have found a place in the subkingdom CŒLENTERATA. See SUBKINGDOMS, ANIMAL. The name *polypi*, or *polyps*, was given by Reaumur about the middle of the last century to these animals, on account of their external resemblance to the many-armed cuttle-fishes, which were so denominated by Aristotle; and our knowledge of these organisms, as members of the animal kingdom, hardly dates back much more than a century. All polyps are aquatic in their mode of life, and almost all of them are inhabitants of the sea, two genera only (*hydra* and *cordylophora*) of fresh-water polyps being as yet known. Most of them live in societies of considerable extent, supported on a common stock, to which the term *polypidom* (polyp-home) is usually given, and which is sometimes horny, and sometime calcareous. The polyps are either imbedded in cavities in the substance of the calcareous polypidom, or inclosed in minute cups or tubes, from which the body can be protruded, and into which it can be retracted at pleasure, in the horny polypidoms. The solitary species often attain a considerable size (as, for instance, many of the actinias); but the social polyps are always minute, although the combined power of some of the species in modifying the earth's crust is neither slight nor limited in extent. "They have built up a barrier reef along the shores of New Caledonia for a length of 400 m.; and another, which runs along the n.e. coast of Australia, 1000 m. in extent. To take a small example: a single atoll (or coral island) may be 50 m. in length by 20 in breadth; so that if the ledge of coral rock forming the ring were extended in one line, it would be 120 m. in length. Assuming it to be a quarter of a mile in breadth, and 150 ft. deep, here is a mound, compared with which the walls of Babylon, the great wall of China, and the pyramids of Egypt are but children's toys; and built, too, amid the waves of the ocean, and in defiance of the storms."—Owen, *Lectures on the Invertebrate Animals*, 2d edit., p. 143.

The bodies of these animals are generally soft, and cylindrical or oval in shape; and

the mouth, which is the only aperture of the digestive canal, and is quite destitute of any masticating apparatus, lies in the center of the anterior or free extremity of the body, and is surrounded by a fringe or circle of tentacles or arms. The skin in the social polyps is exceedingly soft and delicate; but in the solitary species it is often of a leathery consistence. It almost always contains peculiar urticating organs, or thread-like cells, which may be regarded as one of the distinctive characters of the cœlenterata. Various arrangements of the polyps have been proposed, but it is sufficient for all practical purposes if we admit two orders—namely, the *hydrozoa* and the *anthozoa* (or *actinozoa*), which differ essentially in the following points: in the *hydrozoa* the wall of the digestive sac is not separated from that of the somatic (or bodily) cavity, and the reproductive organs are external; while in the *anthozoa* the wall of the digestive sac is separated from that of the somatic cavity by an intervening space, subdivided into chambers by a series of vertical partitions, on the faces of which the reproductive organs are developed. The hydra (q.v.), or fresh-water polyp, is the type of the *hydrozoa*. A few of these polyps are simple animals, as, for example, *hydra*, *corymorpha*, *vorticlava*, and *myriothela;* but the greater number are compound or composite, exhibiting a numerous colony, connected with one another by a common trunk or *cœnosarc* (from the Gr. *koinos*, common, and *sarx*, flesh), which usually presents an erect tree-like form. A sufficient idea of the form and structure of the *simple* polyps of the class will be obtained by a reference to the article Hydra, which attains a length of between 4 and 5 inches, and was discovered by Forbes and Goodsir when dredging in the n. of Scotland. They observed that when it was placed in a vessel of sea-water, it presented the appearance of a beautiful pink flower, its head gracefully nodding (whence the specific name given to it by Sars, who had previously discovered it on the Norwegian coast), and bending the upper part of the stem; it waved its long white tentacles to and fro at pleasure, but seemed to have no power of contracting them. The *compound* hydrozoa include, *inter alia*, the orders *sertularidæ* (embracing the various species of *sertularia*, *campanularia*, *laomedea*, etc.), and *tubularidæ* (embracing the various species of *tubularia*, *eudendrium*, *bimeria*, etc.). A good idea of the nature of the compound hydrozoa may be formed from the consideration of the *campanularia dichotoma*, a common organism on our shores. The compound polyp-animal, or association of polyps, resembles a miniature tree. It consists essentially of a ramified tube of irritable matter, defended by an external flexible, and frequently jointed horny skeleton; and is fed by the activity of the tentacula, and by the digestive powers of the alimentary sacs of a hundred polypi, the common produce of which circulates through the tubular cavities for the benefit of the whole community. The soft integument of the nutrient polyps contains the thread-cells, to which allusion has previously been made. These are protruded when the skin is irritated, and give the tentacles the appearance of being beset by minute bristles. The digestive sac of each polyp is lined by a ciliated epithelium; but there is a perforation at the base communicating with the central tube. This outlet admits only of the passage of the fluid contents of the stomach, undigested matters being ejected by the mouth. There is reason to believe that sea-water enters the branches of the tube and circulates, by means of the ciliated epithelium, through the compound organism; and by this means contributes to the respiratory process. "At certain points of these ramified polyps," says prof. Owen, "which points are constant in and characteristic of each species, there are developed little elegant vase-shaped or pod-shaped sacs, which are called the ovigerous vesicles, or *ovicapsules*. These are sometimes appended to the branches, sometimes to the axillæ. They are at first soft, and have a still softer lining membrane, which is thicker and more condensed at the bottom of the vesicle. It is at this part that the ova or germs are developed, and for some time these are kept in connection with the vital tissue of the polyp by a kind of umbilical cord. In all the compound *hydrozoa*, the ovicapsules are deciduous; and having performed their functions in relation to the development of the new progeny, drop off like the seed-capsules of plants." On other individuals of the same species sperm-capsules are developed, which, in form, resemble the ovicapsules, but in place of ova, contain spermatozoa. The act of fertilization in most cases occurs by diffusion of the spermatozoa in the surrounding water. There is much that still requires elucidation in reference to the various modes of reproduction of this class. Many of the hydrozoa have been shown to be merely larval forms of medusæ. See Generations, Alternation of.

The leading anatomical distinction between the *anthozoa*, or *actinozoa*, and the *hydrozoa* has been already noticed. The common *actinia* (q.v.) may be regarded as the type of this class, all of which are marine, and principally inhabit the warmer or tropical seas. Many of the larger tropical polyps of this class combine with a structure similar to that of the actinia an internal calcareous axis or skeleton, which, penetrating into the interior of the organism, presents the lamellated and radiated structure recognizable in the *fungiæ*, and in the skeletons of *caryophyllæ*, *madreporæ*, etc. Such anthozoa are termed coralligenous; and every hard structure deposited in or by the tissues of this class, and forming a uniform framework, is recognized by zoologists as a coral. Like the members of the preceding class many of the anthozoa multiply freely by gemmation, complex or compound animals or colonies of animals being formed, in which individual polyps are united by a cœnosarc or polypidom. For a description of the mode in which communication takes place between the common body or mass and the individual polyps, we must refer to the article Alcyonium. Various arrangements of this class

have been proposed by zoologists. If we exclude the consideration of fossil genera, we may divide the anthozoa into two orders—the *alcyonaria* and the *zoantharia*.

The *alcyonaria* may be characterized as anthozoa in which each polyp is furnished with eight tentacles, not simple, as in actinia, but furnished with pinnate margins, with eight somatic chambers, and eight mesenteries. With the exception of one genus they are all composite in structure; their polyps being connected with one another by a cœnosarc, which is traversed by prolongations of the somatic cavity of each polyp, a system of canals being thus formed whose parts freely communicate and are readily distensible. Carus, in the *Handbuch der Zoologie*, 1863, vol. 2 (of which he is joint author with Peters and Gerstaecker), mainly adopting Milne-Edwards's arrangement, divides the alcyonaria into the three following families: 1, *alcyonidæ;* 2, *gorgonidæ;* 3, *pennatulidæ*. In the *alcyonidæ* he includes the beautiful organ-pipe corals, of which Green and others make a separate family. The polypidom constructed by *tubipora musica* consists of successive stages of cylindrical tubes of a rich crimson color, united at various heights by means of horizontal connecting plates. The tubes placed upon the upper stage are alone inhabited by living polyps, of a violet or green color, the occupants of those below having successively perished as fresh generations appeared above them. As an example of the *gorgonidæ* we may take *isis hippuris*, in which the skeleton is made up of alternate joints of calcareous and horny matter, with the view of giving the necessary flexibility. In the *pennatulidæ*, the polypidom is free, and no polyps are attached to its basal portion. The *sea-pens* (*pennatulæ*) of the English coast afford a good example of this family. See Pennatula.

The *zoantharia* may be characterized as anthozoa in which the tentacles are either simple or branched, in general numerous, and together with the mesenteries, disposed in multiples of five or six. They may be arranged in the three following suborders: 1. *Z. malacodermata;* 2. *Z. sclerobasica* or *antipatharia* (Milne-Edwards); and 3. *Z. scleroderma* or *madrepores*. The first sub-order has been variously subdivided into families and subfamilies, which it is unnecessary to notice. It contains all the sea-anemones and animals allied to them, including the genera *actinia, anthea, corynactis, capnea, adamsia, ilyanthus, sagartia, bunodes, edwardsia, peachia*, etc., and the *zoanthidæ*, which are aggregated polyps arising from a common creeping root-like fleshy band, and of which at least one species, *zoanthus couchii*, is an inhabitant of the British seas. All the members of the second sub-order are composite structures. *Antipathes*, the type of the group, presents a stem-like, simple, or branching cœnosarc, which in one species tapers to a length of more than 9 ft., with a diameter at the base not exceeding three-tenths of an inch. The third sub-order (the *madrepores*) is a very extensive one. It is divided into the *madrepora aporosa* and *M. perforata*, according as the coral exhibits a solid or a porous structure. *M. aporosa* may be arranged in the following families: 1. *turbinolidæ* (including the sub-families *caryophyllinæ* and *turbinolinæ*); 2. *oculinidæ;* 3. *astræidæ;* 4. *echinoporinæ;* 5. *merulinaceæ;* 6. *fungidæ*, while the *M. perforata* are divided into (1) *madreporidæ* and (2) *poritidæ*. A few of the commoner forms of madrepora are described in the articles Coral and Madrepore. Among the most important works on this department of zoology may be mentioned Dana's *Structure and Classification of Zoophytes* (Philadelphia, 1846); and his *Report on Zoophytes*, and *Atlas of Zoophytes* (U. S. exploring expedition), 1849; Johnston's *British Zoophytes*, in 2 vols.; Hincks, *British Hydroid Zoophytes*—an excellent monograph; Milne-Edwards and Haime, *Histoire Naturelle des Coralliaires ou Polypes proprement dits* (3 vols., 1857–60); and Lacaze-Duthiers, *Histoire Naturelle du Corail, Organisation, Reproduction*, etc. (1864). See also works by Huxley, Haeckel, Claus, etc. See illus., Invertebrates, vol. VIII.

POLYPO'DIUM, a genus of ferns, with spore-cases on the back of the frond, distinct, ring-shaped, in roundish *sori*, destitute of *indusium*. Several species, differing very considerably in appearance, are natives of Britain, where no fern is more common than *P. vulgare*. It grows on rocks, trees, dry banks, etc., and has fronds 2 to 18 in. long, deeply pinnatifid, with large sori.—*P. dryopteris*, with delicate ternate bipinnate fronds, is a fine ornament of many dry stony places in Scotland.—*P. calaguala*, a native of Peru, is said to possess important medicinal properties—solvent, deobstruent, sudorific, etc. See illus., Ferns, vol. V.

POLYPO'ROUS. See Amadou and Dry Rot.

POLYP'TERUS, a genus of fishes, ranked by Cuvier among malacopterous fishes and in the family *clupeidæ*, notwithstanding very important differences of structure; but now constituted by Müller and others into a family, *polypteridæ*, of the order of ganoid fishes. The shape is round and elongated; the head defended by large bony plates, the body covered with large and strong ganoid scales, which are very closely affixed to the skin. These curious fishes, existing remains of a type which was prevalent in former geologic periods, inhabit the rivers of Africa, and lodge in the soft mud. Their flesh is very pleasant. The polypterus of the Nile, called *bichir* by the Egyptians, is said to be one of the finest fishes of that river. It is about 18 in. long.

POL'YPUS, in surgery, is an antiquated term employed to signify any sort of pedunculated tumor attached to a surface to which it was supposed to adhere like a many-footed animal, as its name indicates. The most common seat of polypuses is the mucous membrane, especially that of the nostrils and uterus; but these tumors are also found in the rectum, the larynx, and the external auditory passage of the ear. The only satisfac-

tory mode of treatment consists in their removal, which must be effected in various ways, according to their position, as by the forceps, the écraseur, the ligature, etc.

POLYSTYLE, a term applied to a building with a number of columns, but not the strict number of any of the classic arrangements.

POLYTECHNIQUE (École Polytechnique), or Polytechnic School (Gr. *polys*, many; *technē*, art), was first established in Paris (1794) by the national convention, under the name of *école des travaux publics* (school of public works). No students were admitted but those who intended to enter the public service; and though the general object of the institution was the supplying of well-educated youths to all branches, it was more particularly devoted to the thorough instruction of recruits for the corps of civil and military engineers. The institution received the name of "école polytechnique" in 1795. The pupils were at first 349 in number, and each received, during his stay of two years in the institution, an annual stipend of 1200 francs ($250 nearly); the teachers were in most cases the most eminent savants of France. In 1799 some modifications were introduced into the working of the school; the number of pupils was at the same time limited to 200, and they were put into uniform. The advantages of an institution of this sort, when ably conducted, soon made themselves evident, and the polytechnique, in consequence, rose into high estimation, not only in France, but throughout Europe, so much so, that it became common for foreign nations, when entering into a treaty with France, to stipulate for the admission of a certain number of their subjects into the institution, after passing the prescribed entrance examination. In 1804 the emperor Napoleon introduced various modifications into its working, and gave it a military organization; it was also removed from the Palais Bourbon (where it had existed from its first establishment) to the old college of Navarre. The institution became more and more, as the end of the Napoleonic empire drew near, a training-school for young artillerists and engineers; and such was the enthusiasm of the pupils in the emperor's cause, that, after the disasters of 1814, they demanded to be enrolled *en masse* in the ranks of the French army. However, Napoleon was (to use his own words) not inclined "to kill the hen for the golden eggs;" but he allowed them to form three out of the twelve companies of which the artillery corps of the national guard was composed. These three companies rendered important service in manning the walls of Paris, and behaved heroically in the battle of Mar. 30, 1814. After the first restoration, the polytechnique, being considered to be evil-disposed to the government, suffered considerable reductions; but was restored to its former importance for the brief period of the "hundred days." After the second restoration (July, 1815), the staff of professors was remodeled; Lacroix and some others were dismissed, and replaced by Poisson, Arago, Cauchy, etc. Notwithstanding these changes, the government still had its doubts as to the loyalty of the establishment, and took advantage of an outbreak, April 3, 1816, to break it up. It was reconstituted in September of the same year, under a revised code of regulations, and in 1822 the old severity of military discipline was restored. During the war of 1870–71, the government of national defense ordered the pupils to meet at Bordeaux, and classes were opened there under distinguished pupils of the school brought from all parts of France. However the attempt had to be abandoned, and the pupils having sought permission to take part in the war, were divided among the different sections of the army, in which their services were highly appreciated. The constitution of the school, which has so frequently suffered change, was in the end of 1873 regulated by *décret* of Nov. 30, 1863, and ministerial rules issued on Mar. 5, 1857. 1. No pupil can be admitted unless he has been successful in the public competitive examination which is held each year. 2. The conditions of admission to the competitive examination are, that the candidate shall be a Frenchman; that he shall be more than 16, and less than 20 years of age, on the 1st of January of that year; and that he shall be either a bachelor of letters or a bachelor of sciences of the university of France. If he holds both degrees he is allowed 50 marks in the examination for admission. 3. Regular soldiers are admitted up to the age of 25 years, provided they have been on real and effective service for two years. 4. The charge for board is 1000 francs ($200) per annum, and the cost of outfit (to be also paid by the pupil) about 600 francs. 5. The duration of the course of instruction is two years: the pupils, after finishing their course, must pass a final examination; the successful candidates, if found to be physically qualified, are arranged in order of merit, and choose in order what branch of the public service they wish to enter. 6. The branches of the public service which are recruited from the polytechnique are, the corps of land and naval artillery, military and naval engineers, the imperial marine, the corps of hydrographic engineers, that of engineers of roads, bridges, and mines, the corps of staff-officers, the superintendence of telegraphs and gunpowder and tobacco manufactories; and generally every department which, requiring special scientific knowledge, may be added by *décrets* to these.

The following branches are among those embraced in the curriculum: Mathematics, physics, chemistry, and chemical manipulation, history and literature, German, written exercises, drawing, geodesy, mechanics, architecture, military art. Lessons in fencing, music, and dancing are given out as optional, and must be separately paid for. The number of pupils varies with the requirements of the public service. In 1794 there were 396 pupils; in 1820 only 66. During the first empire, the numbers increased from

110 in 1808, to 227 in 1813; under Louis Philippe the average number was 130. During the second empire, it had risen to 140 and 150. After the war with Germany in 1870–71 the number rose to 260. The numerous and admirably equipped technical schools of England and Germany (see TECHNICAL EDUCATION), often called *polytechnica*, have received no military restriction, and are available for all interested in the industrial arts; they are in many cases scientific centers comparable to the universities.

POLYTHEISM. See GOD.

POLYTRICHUM (Gr. many-haired), a genus of mosses, having the capsule supported on a stalk (*seta*) which is terminal, and thus appears as an elongation of the stem; the peristome single, of 32 or 64 short equidistant teeth, which are curved inward, and their summits united by a horizontal membrane closing the mouth of the capsule. A number of species are found in Britain, of which the most abundant is *P. commune*, sometimes called *hair-moss, golden maidenhair*, and provincially *goldilocks;* growing in heaths and woods, particularly where the soil is sandy; the stems not at all branched, or only at the base, several inches long; the narrow slender leaves sometimes nearly half an inch long. This beautiful moss is very common in the most northern parts of Europe and Asia. See illus., MOSSES, ETC., vol. X.

POLYZOA known also as BRYOZOA (from the Greek *bryon*, moss, and *zoon*, an animal; because many of these organisms incrust other animals or bodies like moss), and CILIOBRACHIATA (from the circumstance that their tentacles are ciliated), are so called from many individuals being united into a colony or polyzoary. Although Dr. Grant, in his *Observations on the Structure and Nature of Flustræ*, in 1827, and Milne-Edwards and Audouin, in their *Résumé des Recherches sur les Animaux sans Vertèbres faites aux îles Chaussey*, in 1828, indubitably showed that these animals more closely resembled, in the details of their organization, the molluscous than the radiate subkingdom, with which they were formerly confounded, some of our most esteemed English writers (including prof. Owens) persist in retaining them among the polyps, instead of placing them in their true position amongst the *molluscoid animals*.

Most of the polyzoa are microscopic; but as they occur in colonies, they often collectively form sufficiently conspicuous masses, and although there is little diversity in the form or structure of the animals themselves, there is much difference in the form, arrangement, and composition of the cells or chambers in which the individual animals reside. "In general," says Mr. Gosse, "the form of the cell is ovate or oblong; but the general shape is variously modified, being tubular, club-shaped, horn-shaped, cradle-shaped, square, etc." The arrangement is often shrub-like, or the cells may be arranged in close series, either adhering in irregular patches, as the *lepraliæ*, or rising into broad, flexible leaves, as the *flustræ*, or common sea-mats, or in solid strong walls, or coral-like masses, as the *escharæ*, or calcareous sea-mats. Each animal lives freely in its cell, with whose walls it is connected only by means of muscular bands and threads at certain points, and by the covering of the mouth of the cell. The animal may either expand itself to a considerable extent out of the mouth of the cell, or it may be altogether restricted within the latter; its movements being due partly to pressure upon the outer walls, and partly to the muscular bands, which act chiefly as retractors. On examining one of these organisms in the expanded state, the mouth is seen to be surrounded by a crown of tentacles, which are most commonly ten or twelve in number, and are clothed with vibratile cilia, which lash the water toward the mouth, and thus create numberless little whirlpools, by which nutritious matter is conducted into the oral aperture of the polyzoa. These ciliated tentacles constitute one of the essential points of difference between these animals and the hydraform polyps, with which they were formerly associated. The mouth leads to a funnel-shaped cavity or pharynx, which is succeeded by an œsophagus, and a true digestive stomach (between which a muscular gizzard intervenes in certain genera), after which the intestine turns back upon itself, and terminates in an anus near the mouth. In the separate intestine and anal orifice, we have another characteristic distinguishing these animals from the polyps. At the base of the tentacular circle, just above the anal orifice, is a nervous ganglion, which in all the polyzoa lies on the re-entering angle, between the two extremities of the intestinal canal. No heart has as yet been discovered, the matters, which result from digestion, percolating through the intestinal walls, and becoming mixed with the fluid in which the viscera floats. According to prof. Allman, three distinct modes of reproduction occur in the polyzoa, viz., by buds or gemmæ, by true ova, and by free locomotive embryos. This subject, however, requires further investigation.

Minute appendages, of a very remarkable character, are fixed to the cells of many of the genera. They are termed *avicularia*, or "bird-head processes," and *vibracula*, or whip-like spines. The *avicularia* were described by Ellis, who first noticed them (in his *Essay towards a Natural History of the Corallines*, 1758), as resembling "a bird's head with a crooked beak, opening very wide;" they consist of a fixed and a movable nipper, like a crab's claw, the latter being worked by special muscles. These moving beaks have been often observed to seize minute animals; but as these organs have no power of passing their prey to the mouth, the polyzoa cannot receive nourishment from this source. Mr. Gosse ingeniously suggests that "the seizure of a passing animal, and the holding of it in the tenacious grasp until it dies, may be a means of attracting the proper prey to

the vicinity of the mouth." The *vibracula* consists of a long, slender movable *seta* or bristle, which, according to Gosse, serves "to rid the animal of intruding vagrants, and to cleanse away accidental defilement, by sweeping across the orifice of the cell." Both these kinds of organs are of service in determining genera. Excellent magnified representations of the *avicularia* and *vibracula* may be seen on referring to Figs. 13 and 11, in Mr. Busk's excellent article, POLYZOA, in *The English Cyclopædia*, to which, as also to that gentleman's *Catalogue of Marine Polyzoa in the British Museum*, and to Prof. Allman's "Report on the Fresh-water Polyzoa," published in the *Reports of the British Association* for 1850, the reader is referred for further information regarding this remarkable class of animals. See also the British Association report on *Fossil Polyzoa*, 1882.

POMACEÆ, or POMEÆ, according to some botanists, a natural order of plants, but more generally regarded as a suborder of rosaceæ (q.v.). The plants of this order are all trees or shrubs, abundant in Europe, and chiefly belong to the temperate and colder regions of the northern hemisphere; they are rare in very warm climates, and are not found at all in the southern hemisphere. They have the botanical characters described in the article rosaceæ (q.v.), and in addition are distinguished by having the tube of the calyx more or less globose, the ovary fleshy and juicy, lined with a thin disk, its carpels adhering more or less to the sides of the calyx and to each other; the fruit a *pome* (q.v.), 1 to 5 celled, in a few instances spuriously 10-celled; the ovules in pairs, collateral. Many of the species are prized for the beauty and fragrance of their flowers, some produce valuable timber; but the order is chiefly remarkable as producing a number of the very finest fruits of temperate climates. See APPLE, PEAR, QUINCE, MEDLAR, LOQUAT, HAWTHORN, CRATÆGUS, AMELANCHIER, ROWAN, SERVICE.—There are about 200 known species.

POMADE, or POMATUM, is a preparation used instead of liquid oil for the hair. It consists of a fine inodorous fat, such as lard or suet; but neither of these are quite free from smell, and the most careful perfumers render them so by a peculiar process. They melt them in a steam-bath, and to every ¼ of cwt. add 1 oz. of alum and 2 oz. of salt, continuing the action of the heat till any scum ceases to rise; the scum is carefully removed, and the fat allowed to cool, after which it is levigated with cold water with great care and patience until every particle has been acted upon, and the salt, alum, and albuminous matters are perfectly washed out, after which it is remelted in the steam-bath, and any remaining water falls to the bottom; when cold, it is fit for use. The perfumer then takes portions of this prepared fat, and remelting each separately, adds a little wax or spermaceti to give it consistency, and perfumes it with some essence. The varieties of pomades are as numerous as the perfumed essences. Anciently, they were made by boiling over-ripe apples in fat, by which the peculiar smell of the fruit was communicated, and this originated the name, which is derived from *pomum*, an apple.

POMARE IV., Queen of the Society Islands : 1813–77 : succeeded her brother Pomare III., 1827, Jan. In 1843, in spite of her protests, the island of Tahiti was placed by native chiefs under the protection of the French, who subsequently gained possession of all the neighboring islands. Public attention in France was thus directed to the islands, which were painted as a sort of savage El Dorado, and became favorite subjects with chansonnières and vaudevillists. A celebrated dancer at the Mabille, in Paris, Elise Sargent (1824–52), was dubbed Queen Pomare by the students.

POMARIUS, the Latin name of a German Protestant minister and author, SAMUEL BAUMGARTEN, who was b. in 1624 and d. in 1688.

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